A National Journal of Indian Association of Preventive and Social Medicine

HEALTHLINE

pISSN 2229-337X / eISSN 2320-1525

VOLUME : 15 ISSUE : 1 JANUARY - MARCH 2024

For more details visit : www.healthlinejournal.org

HEALTHLINE JOURNAL

A National Journal of

Indian Association of Preventive and Social Medicine managed by IAPSM-GC

Volume : 15 Issue : 1 (January - March 2024)

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Competency Based Medical Curriculum: Challenge or Opportunity?

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Let me start with an incidence recently I had and my heart was broken to know that my students are not referring the textbook of Community Medicine or any other subject rather using some easy to read notes and guide with objective type question answers. It made me to think again and again that how and what should we do to make them read the subject through textbook and develop deeper understanding of topics and its applications. As there is a saying "Once you get into the field of medicine you are a student forever" but today's students are focusing to clear NEXT and getting the subject for PG but are we really looking this? No, We are expecting Indian Medical graduates with certain qualities given by NMC i.e. **Clinician** who understands and provides preventive, promotive, curative, palliative and holistic care with compassion, **Leader and member of the health care team** and system with capabilities to collect, analyze, synthesize and communicate health data appropriately, **Communicator** with patients, families, colleagues and community, **Lifelong learner** committed to continuous improvement of skills and knowledge, **Professional,** who is committed to excellence, is ethical, responsive and accountable to patients, community and profession. In order to see such qualities in our graduates we faculty need to work hard to make our students understand and realize about these goals and objectives.

How can we do that?

We need to adopt system approach including Input, Process and output. In Input we need to identify smart system of Teaching Learning material and method which should involve students actively, we must develop in them reading habits through text books for deeper understandings of topics which will further develop analytic competency and generation of various questions regarding topics.

The Process should be based on three aspects i.e. AIMS and Objectives based Teaching and Learning, Planning and Implementing TL Process in order to achieve the Aims and objectives, Planning and implementation of a scheme of Assessment again based on Aims and objectives. These all process must keep students engaged and must be students' centric not Teachers' centric.[1]

Then we need to work on our assessment process and need to develop the valid tools of assessment. And these valid tools must be used by all medical colleges of our country. Then only we would be able to see whether our medical graduates are competent for expected competencies or not. Our assessment tools should help to interpret the tests score of students. It should not only for pass or fail but beyond it.

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Toppo N.Competency Based Medical Curriculum: Challenge or Opportunity? Healthline. 2024; 15 (1): 3-6
	DOI : 10.51957/Healthline_ 613_2024	

The Educational Spiral as teaching approach:

Jerome Bruner proposed the spiral curriculum as a teaching approach in which **each subject or skill area is revisited at intervals, at a more sophisticated level each time.** First, there is basic knowledge of a subject, and then more complexity is added, reinforcing principles that were first discussed. That is very important aspect to make our teaching Learning very effective and engaging not only through our traditional system of two internal assessment, Pre university examination and Summative examination. We need to find out whether the system of teaching learning is the effective or not or if efficiency is found to be below par, then we need to revise the whole process of education, so that the subsequent process cycles will perform better. This process is considered as the educational spiral where each cycle of input, process and output is an environment of the previous cycle, keeping the system dynamic. We as community medicine faculty need to work on that and find out the best model of teaching learning of our subject. We need to put various efforts to implement this kind of system thinking in educational contexts, and explore learning environments which could be expert presentation, simulation, and real-world. Many educationist advocated both real-world and simulated learning environments, which needs extra efforts and resources.[2,3] If we could developed some valid tools that will make students to read , understand and applying the learning in real world. Because patients come to doctor with expectation that doctor will apply his knowledge in him/her and make them cure. Therefore its our responsibilities to make them competent, knowledgeable and clinician who can solve the problems of patients and community.

Whatever learning environment we will adopt we need to make sure that our students must go through various levels of learning process, these are:

1. Signal Learning: This is the simplest form of learning which consists of diffuse and involuntary emotional responses associated with stimulus response learning. Signal learning is based on Pavlov's conditioned responses.
2. Stimulus-response Learning: It is a precise and voluntary response to a stimulus and it is based on Skinner's operant conditioning.
3. Chaining (Motor): Chaining involves meaningful linking of multiple previously learned motor responses.
4. Verbal Chaining: Verbal chaining involves association and linking of meanings represented by words.
5. Discrimination Learning: Discrimination is the ability to distinguish between similar looking objects, ideas and stimuli. Distinctive features facilitate discrimination.
6. Concept Learning: Concrete concepts (e.g., cell, tissue) are identified by pointing out but abstract concepts (e.g., informed consent, compassion) must be defined for identification. Concept learning helps in classifying stimuli on the basis of their characteristics.
7. Rule Learning: A rule is a statement specifying relationship of two or more concepts.
8. Problem Solving: It is the highest form of learning which involves learners to use several rules to solve a practical problem.[1]

During this process of teaching learning we

need to follow certain principles where The concepts embodied in various theories of learning have helped in evolving several principles of learning. These principles can be applied in teaching-learning activities to enhance learning. Some important principles are described below and their implications and applications are suggested.

1. Goal Setting

   All human actions are guided by underlying goals. The goals are always present although they may be unclear and we may not be aware of them. The importance of goals or objectives in the teaching-learning process cannot be overemphasised. According to Mager, "if you help each learner to develop his/her learning objectives you may not have to do much else". Unequivocal learning objectives help both teachers and learners to play their appropriate roles in the teaching-learning process effectively.[4] Specific educational objectives incorporating acceptable levels of performance or criteria facilitate evaluation and allow learning process to continue until each student achieves mastery or an acceptable level of performance (mastery learning). A teaching-learning process in which mastery-learning is the goal has a flexible time schedule to allow for different individual rates of learning. Such a curricular process is called a competency based curriculum.

2. Relevance of Learning Experience

   Medicine is an applied science and the learning experience and the underlying learning objectives must have a direct or indirect relevance to the care of humans in health and disease. Medical students as adult learners need to know why they should learn something. Long-term relevance of the learning experience activates intrinsic motivation for learning. Hence, it is essential that the students understand the relevance of all learning experiences that are being Teaching Learning Principles provided to them. Life-oriented education is another term used to describe such teaching-learning experiences. As this is the big challenge before all of us due to the motive of students these days have been shifted.

3. Motivation

   Motivation is a strong reason for doing something. It arises from the needs of a person. Maslow grouped the human needs into seven classes and arranged them in the following hierarchy starting from the most vital physio-logical needs.[5]

   (a) Physiological needs (need for food, water, air, sex, activity, rest, etc.)

   (b) Safety needs (need for security, regularity, predictability, etc.)

   (c) Social needs (need for love, affection, belongingness, etc.)

   (d) Esteem needs (need for attention, appreciation, independence, recognition, etc.)

   (e) Need for self-actualization (need for creativity, inter-personal relationship, social interest, problem- centred behaviour, etc.)

   (f) Need to know and understand

   (g) Aesthetic needs

According to this hierarchy, when a lower need (e.g., physiological needs) is satisfied, only then there is motivation to meet the needs of the next higher order (e.g., safety needs). Thus, motivation for learning (need for self-actualization, need to know

and understand and aesthetic needs) comes only after more basic deficiency needs (physiological needs, safety needs, social needs and esteem needs) are fulfilled. The teaching-learning activities should occur in an atmosphere where the basic deficiency needs of the students are met. There is the role of faculty as facilitator or motivator which is crucial. In present scenario where motive for study MBBS has been changed and we are observing the deterioration in academic performance. We need to find the ways to achieve the given GOALS by NMC. Motivation could be classified as intrinsic and extrinsic. In intrinsic motivation the students learn for learning's sake. Intrinsic motivation arises fromthe expectation of long-term utility of a learning task and depends on the relevance of learning experience to the future task of the learners. In extrinsic motivation the students learn for some extrinsic rewards such as completion of a course and getting the reward or a good performance in the examination which becomes the main motivating force.

Conclusion:

Competency based Medical education is an opportunity for all the Faculty of our Country. As of now our role is not teachers but more than that we are facilitators, mentors for teaching learning and we need to make plan for that in such a way where students must be involved actively throughout the process of teaching learning. Our examination system must evaluates the students for knowledge and skills needed for their future professional tasks as a best clinician, Public health specialist, Communicator, Leader, Life long learner. There should no difference in the intrinsic and extrinsic motivation, so that students pursue learning activities with optimum interest.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Perceived Social Support and Glycemic Control among Type 2 Diabetes Patients in a Tertiary Care Cente in Chennai, Tamil Nadu, India

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Abstract:

Introduction: Support from the external environment for enabling behavioral change, is often instrumental in mediating glycemic control in patients coping with diabetes. While evidence is scant in the Indian setting, there is a lack of consistency in findings among studies done elsewhere. **Objective:** To assess the perceived availability of social support and its association with glycemic control among type 2 diabetics. **Method:** Between October and December 2019, a cross sectional study was conducted among 150 adult patients at the Diabetology clinic in a tertiary care centre in Chennai. Outpatients with a confirmed diagnosis of type 2 diabetes for at least one year, were recruited by convenient sampling. Perceived social support was assessed using the RAND-MOS social support survey instrument, while average of last three fasting blood glucose (FBG) readings determined glycemic status. Non-parametric Kruskal Wallis and Mann-Whitney U tests were used to analyze association of social support with glycemic control and socio-demographic determinants. Spearman's correlation coefficients with 95% CIs are reported for association of individual domain scores with average FBG. All analyses were performed with SPSS Version 23. **Results:** Study participants were aged 35 to 85 years, and living with type 2 diabetes for a mean duration of 10 ± 7.7 years. The average FBG in the past year ranged from 79 to 398 mg/dl in these patients, with 41 (27%) and 109 (73%) being classified as having good and poor glycemic control, respectively. The median (IQR) social support summary score was 62 (40-81) on a scale of 0 – 100; perceived social support was reportedly low, intermediate, and high in 36 (24%), 74 (49%) and 40 (27%) participants, respectively. The level of social support was not found to be significantly associated with glycemic control (P=0.628); average FBG and summary social support score showed no correlation [ρ=.081 (95% CI: -.097, .253), P =.322]. **Conclusion:** While a three-fourths majority reported availability of social support for coping with diabetes, this was not found to be significantly associated with glycemic status. The potential role of support networks, beyond the immediate family, in improving health outcomes needs to be examined.

Keywords: Diabetes, Family, Glycemic Control, Perceived Support, Social Support

Introduction:

According to the latest report (2021) of the International Diabetes Federation, one in 10 adults globally are estimated to have type 2 diabetes mellitus, with low and middle income countries accounting for three-fourth of the burden.[1,2] India has an estimated 77 million adults living with type 2 diabetes and more than 50% are not aware of their diabetic status.[3] Rapid urbanization and an aging population combined with dramatic changes in lifestyle are the major factors contributing to this surge in its prevalence.[1] The most conspicuous

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Deepanchakravarthi V, Murugan A, Shruthee SG. Perceived Social Support and Glycemic Control among Type 2 Diabetes Patients in a Tertiary Care Center in Chennai, Tamil Nadu, India Healthline. 2024; 15 (1): 7-14
	DOI : 10.51957/Healthline_ 593_2024	

attribute of the illness is its chronicity, which demands life-long adherence to medication and lifestyle modifications; severe end organ damage and premature death are well documented consequences of long standing uncontrolled diabetes.[4]

Several studies point to the association of perceived social support with improved outcomes in patients coping with diabetes, through intermediate pathways of effective self-care practices and sustained adherence to treatment recommendations.[5–7] Social support may be defined as 'a personal perception of known and unknown needs that are gratified by significant help from others through individual or community interaction andcontacts'.[8] It is a qualitative construct that informs us about the functional and behavioral aspects of a person's social network; it may not necessarily be a positive influence.[9] In recent times, social support is being increasingly recognized as a mediator or moderator of health outcomes. Available evidence suggests that social support may play various roles in the management of diabetes: 1) informational support regarding treatment, complications and follow up, 2) emotional or affectionate support that fosters comfort and helps deal with perceived stress and 3) tangible support, which is practical assistance with daily living such as with household chores, preparation of diabetic-friendly meals, and satisfying financial and other needs for accessing health care.[10]

Attaining Glycemic control often requires psychosocial interventions, for effective behavioral change and self-care; mere physician initiated medical treatment may at best, play a cursory role.[11] However, results from available studies,[12–16] exploring the role of social support in mediating Glycemic control among diabetic patients, are inconsistent. Due to this, and a paucity of published studies in the Indian context, the present study aims to estimate the perceived availability of social support and to determine its association with Glycemic control in patients with type 2 diabetes mellitus.

Methods:

A single-center facility level cross sectional study was conducted at the Diabetology outpatient clinic in a Government Medical College Hospital, Chennai during the period from October 2019 to December 2019. Outpatients aged 18 years and above, with a confirmed diagnosis of type 2 diabetes mellitus, who have known their disease status for at least one year prior to the study were eligible to participate in the survey. Based on the mean (SD) social support score of 68.1 (16.97) reported in the study done by Chew BH et al[8], the minimum sample size required for estimation of mean social support was found to be 123 using the formula $(z_{\alpha/2})^2SD^2/d^2$[17] with an absolute precision (d) of 3 at 95% confidence level ($z_{\alpha/2} = 1.96$) ; hence a final sample size of 150 was decided. Patients reporting to the facility, satisfying the inclusion criteria were sampled conveniently, until the required sample size was reached.

The data was collected by personal interview using a semi-structured questionnaire in the local language, after obtaining written informed consent. Information regarding the socio-demographic characteristics and relevant clinical history was collected, followed by assessment of availability of social support using the RAND Corporation – Medical Outcomes Study (RAND-MOS) social support survey instrument.[18]The survey instrument is available free of charge; translation of the tool to the local language was performed by the investigators, followed by back-translation by a third party to check for appropriateness. Median (Interquartile range) score in each domain of social support, overall summary index score and its association with Glycemic control and relevant socio-demographic determinants were the primary and secondary outcomes studied.

Social support, in this study, refers to perceived availability of support from any person who is a friend or family member in imagined social conditions in the past 1 year, as measured using the survey instrument by RAND - MOS. It is a 19 item multi-dimensional instrument developed as part of

the Medical Outcomes Study (MOS)[19] conducted at RAND Corporation for studying healthcare outcomes in patients with chronic conditions. It comprises 4 sub-scales that measure various dimensions of social support: emotional support/informational support (items 2, 3, 7, 8, 12, 15, 16, and 18), tangible support (items 1, 4, 11, and 14), positive social interaction (items 6, 10, 17), and affectionate support (items 5, 9, and 19), and one overall summary index. These 19 items are given a score of one (none of the time) to five (all the time) each. The respondent-specific mean score of the items in each sub-scale is calculated, ignoring items with missing values; the overall summary index score is calculated by averaging scores of all 19 non-missing items, resulting in scores in the scale of one to five for each domain and the summary index. These scores are then transformed to have a possible range of 0 – 100, with a higher score indicating better social support. Perceived social support is classified into 3 groups: low, intermediate and high using 40% and 80% of the total score as the cut-offs.

Glycemic control was assessed based on the average of three most recent fasting blood glucose (FBG) levels within the past one year. As per American Diabetic Association 2019 guidelines, FBG in the range of 80 - 130 mg/dl was defined as good Glycemic control[20]while any reading outside this range was categorized as poor Glycemic control for the purpose of this study. The association of social support summary index scores with Glycemic control and socio-demographic determinants was analyzed using Kruskal Wallis or Mann Whitney U tests as appropriate. Spearman's correlation coefficient (ρ) was estimated to determine correlation of individual domain scores with average FBG; 95% confidence intervals are reported. A *P* value < .05 is statistically significant. All statistical analyses were performed with SPSS (version 23; SPSS, Inc., Chicago, IL, USA). The study protocol was approved by the Institutional Ethics Committee.

Results:

The mean age of the 150 participants recruited for the study was 59 ± 9 years, with the minimum and maximum age being 35 and 85 years, respectively. The male to female ratio was 1: 1.6, with a two-thirds majority currently married. Household size ranged from one to ten, with a median (IQR) household size of 4 (2-5). Table 1 and Table 2 show the socio-demographic and clinical profile of the study participants.

Table 1: Socio-demographic profile of the study participants (N=150)

Variables	n (%)
Age (years)	
<40	4 (2.7)
40-60	80 (53.3)
>60	66 (44)
Sex	
Male	57 (38)
Female	93 (62)
Marital status	
Single	1 (0.7)
Married	104 (69.3)
Widowed/separated	45 (30)
Educational status	
Illiterate	47 (31.3)
≤10 years of schooling	69 (46)
>10 years of schooling	32 (21.3)
Graduate	2 (1.3)
Employment Status	
Unemployed	103 (69)
Employed	47 (31)
Socioeconomic status*	
Upper	12 (8)
Upper middle	54 (36)
Middle	56 (37.3)
Lower middle	26 (17.3)
Lower	2 (1.3)

**Modified BG Prasad scale with CPI(IW) updated as of August 2019.*

Table 2: Diabetic profile of the study participants (N=150)

Variables	n (%)
Age at diagnosis (years)	
< 40	36 (24)
≥ 40	114 (76)
Duration of diabetes (years)	
<10	87 (58)
10-20	50 (33)
>20	13 (9)
Treatment	
Oral hypoglycemics	119 (79)
Insulin with oral hypoglycemics	31 (21)
Glycemic Control*	
Good	41 (27)
Poor	109 (73)
Complications	
Present	61 (41)
Absent	89 (59)

**Based on average of last three fasting blood glucose (FBG) readings; FBG in the range 80 – 130 mg/dl was classified as good control.*

While 4% and 13% reported being current and former smokers, 6% and 13% were current and former drinkers respectively. The proportion of patients with early-onset diabetes (age at onset less than 40 years)[21] was 24%. Patients were aware of their diabetic status for a mean duration of 10 ± 7.7 years, with the minimum and maximum duration being 1 year and 45 years, respectively. The average of last three FBG readings in the past 1 year in these patients ranged from 79 to 398 mg/dl, with a median (IQR) of 175 (127 - 232) mg/dl. Based on ADA 2019 guidelines, nearly three-fourth of the patients were categorized as having poor Glycemic control; one-fifth of the participants were currently using insulin at the time of the study. Among the 61 patients identified with diabetes-related morbidity, peripheral neuropathy (22,36.1%), chronic kidney disease (14,23%), diabetic ulcer (13, 21.3%) and ischemic heart disease (12,19.7%) were observed respectively, in decreasing frequency.

Table 3: Median (IQR) scores and levels of perceived social support among Diabetic patients (N=150)

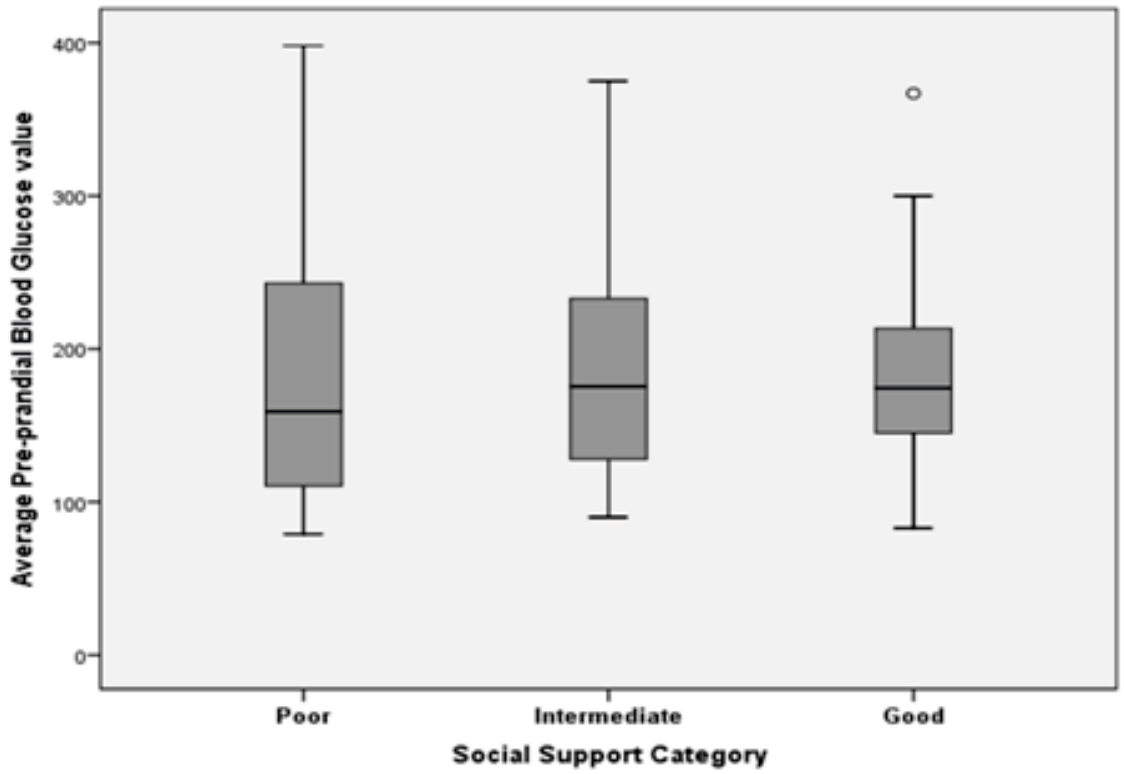
Social support domain	Median (IQR) Score	Levels of social support, n (%)		
		Low (0 - 39*)	Intermediate (40 - 79*)	High (80 - 100*)
Emotional Support	50 (27-75)	46 (31)	70 (46)	34 (23)
Tangible Support	75 (50-100)	29 (19)	48 (32)	73 (49)
Affectionate Support	75 (41-100)	35 (23)	61 (41)	54 (36)
Positive Social Interaction	25 (0-50)	86 (58)	59 (39)	5 (3)
Overall Summary index	62 (40-81)	36 (24)	74 (49)	40 (27)

*Note. *40% and 80% of total score are used as cut-offs for classifying three levels of social support*

Median (IQR) social support summary index score for study participants was found to be 62 (40-81); with 49% and 27% having intermediate and high levels of perceived social support. The median (IQR) score in each domain of social support along with categorization of study participants based on perceived availability of social support is given in Table 3. Poor correlation was observed between overall summary index score and household size [ρ = .185 (95% CI: .028, .338), P = .023]. Figure 1 shows the distribution of average fasting blood glucose in the past 1 year in individuals reporting various levels of perceived social support.

It is seen that, there is no statistically significant difference with respect to the average Fasting Blood Glucose value (FBG) between these groups and the

Figure 1: Distribution of average fasting blood glucose in participants reporting various levels of social support (N=150)



range of the distribution becomes increasingly narrower with higher levels of support. It is notable that only one (2.5%) participant had an average FBG above 300 mg/dl in the high social support category, while 6 (8.1%) and 4 (11%) had average fasting values above 300mg/dl in the intermediate and low categories respectively.

Table 4 reports the correlation of scores in each domain of social support with average fasting blood glucose levels among study participants.

Regarding the association of perceived social support with socio-demographic determinants of the participants, it was found that apart from marital status (P = .028), all other variables are seen to have no significant association with availability of social support among. Relevant clinical features such as age at diagnosis (P = .311), duration of diabetes (P = .346), or presence of secondary complications (P = .868) also seem to have no significant association with perceived social support in these patients.

Table 4: Correlation of social support domain scores with average fasting blood glucose levels (N=150)

Domains of Social support	ρ*	95% Confidence Interval for ρ		p value
		Lower limit	Upper limit	
Emotional support	0.088	-0.085	0.246	0.283
Tangible support	0.061	-0.107	0.227	0.460
Affectionate support	0.145	-0.025	0.302	0.076
Positive Interaction	-0.088	-0.248	0.080	0.285
Overall summary index	0.081	-0.097	0.253	0.322

*Note. *Spearman's correlation co-efficient*

Discussion:

It was observed that approximately one-fourth and one-half of the patients with type 2 diabetes in this study reported high and intermediate levels of perceived social support, respectively. A similar proportion (29.7%) of participants reported high levels of social support in a study conducted at an institution attached urban primary health center in Malaysia in 2015,[8] which also used the RAND-MOS tool for measuring social support. A facility based study in Ethiopia[22] using the Diabetic social support tool[23,24] classified 55% of its diabetic patients as perceiving good social support; informational (55%), emotional (53%), companionship (53%) and tangible (49%) support were the most common forms of social support reported by participants. Whereas, in the present study, majority of participants reported tangible and affectionate support as the most commonly available forms of support, followed by emotional and informational support, while positive social interaction took a backseat.

While the difference in reported social support levels may be explained partially by varying socio-cultural perceptions and practices in different country settings, the absence of uniformity in measurement tools and cut-offs employed for classification of perceived social support must also be considered. While we have employed a cut-off of more than 80% of the total score to define high social support in this study, above mentioned studies[8],[20] have used 75% of total score and mean score as cut off points respectively for characterizing the same parameter. The justification for using 40% and 80% of total scores as cut-offs for classifying social support into three categories in this study, is that upon transformation back to the original response item scale of 1-5, these limits correspond to classification of participants based on their average responses; responses ranging between 'none' or 'little of the time' as low social support, between 'little', 'some' and 'most' of the time as intermediate, and 'most' or 'all of the time' as high social support.

No statistically significant association was found between perceived social support and Glycemic control in our study. Studies conducted in Asians[12-13] have shown a significant positive association between social support and Glycemic control; other studies done in Asia and elsewhere [7-8,15-16,23] negate this finding. A study conducted in a Chinese healthcare facility[12] indicates that social support helps in improving Glycemic control as it has a direct effect on patients' self-motivation and confidence; structural equation modelling describes this relationship to be completely and sequentially mediated by self-care and adherence. Similarly, an Indian study[14] in 2016 has shown that social support positively influences self-management behaviors in diabetes such as diet control, physical activity and Glycemic monitoring. A systematic review by Kadirvelu et al in 2012 substantiates this finding, and further recommends for inclusion of psycho-social interventions in the management of diabetes.[10]

As the participants in this study sought care from a tertiary level facility, with a considerable proportion falling on the severe end of the disease spectrum, as indicated by insulin usage and presence of end organ damage in 21% and 41% of these patients, whether this could have potentially modified the effect of available social support on Glycemic control needs to be examined. Furthermore, the mean duration of diabetes among study participants was 10.4 years and the possibility that the chronicity of disease and the resulting heightened β-cell dysfunction may dampen the effect of social support on Glycemic control as described in a similar study by Chew et al,[8] must also be entertained. Available evidence[26,27] suggests that duration of diabetes is an important determinant of Glycemic control. Studies done by Karimy et al[28] and Mohebi et al[15] describe a significant association between duration of diabetes and social support, with availability of social support diminishing with increase in disease duration. In our study, we did not find any significant association between disease duration and social support.

The social support summary index score was significantly associated with the marital status of the study participants. Spousal support constitutes a major aspect of the support received by an individual, and married individuals usually have a wider social network and interactions compared to those living alone.[29,30] Gender, education and employment status of the study participants were not seen to be associated with social support; however, men on average scored higher on the social support scale. A study conducted by Mohebi et al[15] in Iran shows male diabetics reporting higher levels of social support; and this is consistent with the socio-cultural norms generally prevalent among Asians, where women often exclusively fulfil the care and support roles within a family.

The poor correlation observed between household size and availability of social support is contrary to expectations of availability of better support in a larger household, as documented in a study conducted by Chew et al.[8] The role of recent technological developments in fulfilling social support needs without requiring direct personal contact, may need to be considered in this context. A systematic review of six controlled intervention studies by Van Dam et al to determine the role of social support in diabetes in 2005 found that new forms of social support such as group consultations, internet or telephone based peer support, and support groups were promising avenues, while classic forms of support from family and friends did not improve control of diabetes.[31]

Conclusion:

Nearly three-fourth of the participants in this study reported intermediate or high levels of classic forms of social support, especially in marital relationships, for managing their diabetes. However, a positive association of perceived social support with Glycemic control could not be established in this study. Further research exploring newer avenues for creating and establishing support networks, beyond the context of family, is imperative for improving health outcomes in patients coping with chronic illnesses.

Limitations:

This study has several limitations. Being a tertiary facility-based study, this may introduce selection bias with regard to representativeness across the disease spectrum; this precludes generalizability of results to the average diabetic individual in the community. Due to resource constraints typical of a public facility, fasting blood glucose rather than glycosylated hemoglobin (HbA1c) was used for classifying Glycemic control in these patients, despite the latter being the more specific test. Furthermore, possibility of construct bias in the assessment of perceived social support cannot be excluded as the survey instrument has not been validated in the study setting, despite being validated and adapted to other Asian countries such as neighboring China and Taiwan.

Acknowledgements:

Authors thank Dr. A. Shanmugam, Associate Professor of Institute of Diabetology, Stanley Medical College, Chennai for facilitating the conduct of this study. We are also grateful to all those who enthusiastically participated in the study.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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A Cross Sectional Study on Self-Reported Tobacco Use and Tobacco Related Behaviour among Medical Students in Goa, India

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Abstract:

Introduction: Tobacco is a major cause of preventable mortality and morbidity. Healthcare personnel are involved with smoking cessation advice and treatment of patients; their use of tobacco and related behaviour is an important public health problem. **Objectives:** To determine the proportion of tobacco use, exposure to second-hand tobacco smoke among medical students and to describe their tobacco-related behaviour and attitude regarding tobacco use. **Method:** A cross-sectional study was conducted at Medical College of Goa from July-August 2023. The sample size was calculated using a standard formula based on results of a systematic review, it included 255 medical students and interns selected by simple random sampling. The Global Health Professions Student Survey (GHPSS) was used as the study tool which is specifically designed for knowing the tobacco usage. **Results:** Among medical students surveyed, 23.5% (n = 60) reported ever smoking cigarettes, with 8.6% (n = 22) being current smokers. Additionally, 7.1% (n = 18) reported using smokeless tobacco. Exposure to passive smoking was prevalent, with 31.3% (n = 80) experiencing it at home and 43.9% (n = 112) in public places, surpassing active smoking. The majority of students expressed support for tobacco ban (78.8%, n= 201), and nearly all (98.4%, n= 251) agreed that healthcare professionals should advise patients to quit tobacco use. While over half of the current smokers attempted to quit in the past year, only 15% received professional assistance in their cessation efforts. **Conclusion:** The results of this study indicate that while a significant proportion of students were exposed to tobacco use, there is a prevailing support for tobacco control measures among them but actual implementation of such measures is lacking.

Keywords: Medical Students, Smoking, Tobacco

Introduction:

Tobacco is a major risk factor for various non-communicable diseases and a major cause of preventable mortality and morbidity. According to the WHO, more than 8 million people die each year from tobacco use.[1] Tobacco poses not only a threat to smokers but to non-smokers as well. Exposure to second-hand tobacco smoke is known to cause multiple adverse outcomes and causes 1.2 million deaths annually.[1] Tobacco is the only legally available consumer product that has the ability to not only produce addiction but to kill as well. Tobacco contains nicotine, which is highly addictive and is known to produce an even more severe addiction than cocaine, which is why its users find it difficult to quit. [2]

Health care personnel are directly involved with smoking cessation advice and treatment of patients,

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	GodinhoN, Cacodcar J.A Cross Sectional Study on Self-Reported Tobacco Use and Tobacco Related Behaviour among Medical Students in Goa, India. Healthline. 2024; 15 (1): 15-22
	DOI : 10.51957/Healthline_ 598_2024	

and as such, their use of tobacco and related behaviours is an important public health problem. Counselling and pharmacotherapy provided by doctors to their patients were found to increase their likelihood of quitting smoking by twofold.[3] It was found that doctors who use tobacco products were less likely to elicit tobacco use histories from their patients' and also less likely to give cessation advice.[4]

The objective of this study was to determine the proportion of tobacco use and exposure to second-hand tobacco smoke among medical students at Goa. The secondary objectives were to describe the tobacco-related behaviour among these students and their attitude regarding use of tobacco products.

Method:

A cross-sectional study was conducted at Goa Medical College, the only Medical College in the State of Goa. The data was collected over a period of two months, i.e., July–August 2023, after obtaining Institutional Ethics Committee (IEC) approval.

The study tool used was the Global Health Professions Student Survey (GHPSS), which is a validated questionnaire. The GHPSS is a standardized, anonymous, self-administered questionnaire that included questions on demographics, the prevalence of cigarette smoking, and the use of other tobacco products. It also included questions on knowledge, attitude about tobacco use, exposure to second-hand tobacco smoke, desire to quit smoking and training received in regard to counselling and smoking cessation techniques.[5] The questionnaire required 15-20 minutes to be filled out and was administered as a physical questionnaire. The study included undergraduate medical students from the first, second, third, and final years of MBBS, as well as MBBS interns enrolled for the academic year 2022-2023.

The sample size was calculated to be 255 with a 95% confidence interval, 5% allowable error, and 21% prevalence based on a study done by Sahu A et al.[6] The sample size was calculated using the formula $n= Z^2p(1-p)/d^2$.

The study participants were selected using simple random sampling. A list of medical students and interns was obtained, and each participant's name was randomly selected from the list using the lottery method. The questionnaire was administered to each of the participants after their daily lectures or ward rotations. In case any of the participants were absent on the day of data collection, a second or third attempt was made to reach each of the selected participants. Those students who could not be reached even after three attempts were excluded from the study, and another student was randomly selected from the list.

Written informed consent was obtained from each of the participants prior to the commencement of the study. The ethical clearance for this study was obtained on July 12, 2023, from the IEC of Goa Medical College under the reference code GMCIEC/2023/231

Operational definition:

Current smokers were defined as those who smoked any tobacco product at least on one day during the last 30 days before the survey.[7]

Statistical Analysis:

The data was entered in MS Excel and analyzed using SPSS version 26. Categorical data was expressed in frequencies and proportions. Chi-square was used for determining statistical significance. $p< 0.05$ was taken as the level of significance.

Results:

A total of 255 students participated in this study; among them, 148 (58%) were female and 107 (42%) were male. The majority of the students belonged to the 19–24 age group. There were 43 (16.9%) students from the first year, 52 (20.4%) from the second year, 48 (18.8%) from the third year, 43 (16.9%) from the final year, and 69 (27.1%) were

interns. The Socio-Demographic Characteristics of the study participants are given in (Table 1)

Tobacco use

The proportion of students who had ever smoked or experimented with smoking cigarettes was found to be 60 (23.5%). Among the students, only 22 (8.6%) reported that they currently smoke cigarettes. (Table 2) The majority of the students who smoked reported having their first cigarette between the ages of 20 - 24 (25, 9.8%), and only 2 (0.78%) students reported having tried a cigarette before the age of 10. The proportion of students who smoked cigarettes was highest among the third-year medical students and least among the second-year medical students.

The proportion of students who used smokeless forms of tobacco was found to be 18 (7.1%). Among these students, only 6 (2.3%) reported having used smokeless tobacco products in the last 30 days. (Table 2)

Use of tobacco products in college or hospital premises

A small number of students, 6 (2.4%), reported having smoked cigarettes in college or hospital premises, while 4 (1.6%) students reported having used smokeless tobacco on college or hospital premises. The Gender wise distribution of tobacco use among medical students is given in (Table 2)

Table 1: Distribution of Students by Age, Gender, and Year of Study (N= 255)

Variable	Total	Smokers n (%)	Non -smokers n (%)	Chi-square	p-value
Age (in years)					
15-18	3	0	3 (100%)	4.73	0.094
19-24	239	54 (22.5%)	185 (77.5%)		
25-29	13	6 (46.1%)	7 (53.9%)		
Year of Under Graduate Study					
First MBBS	43	9 (20.9%)	34 (79.06%)	8.506	0.075
Second MBBS	52	7 (13.46%)	45 (86.54%)		
Third MBBS Part-I	48	18 (37.5%)	30 (62.5%)		
Third MBBS Part-II	43	9 (20.9%)	34 (79.06%)		
Internship	69	17 (24.63%)	52 (75.37%)		
Gender					
Male	107	30 (28.03%)	77 (71.9%)	2.08	0.149
Female	148	30 (20.2%)	118 (79.7%)		

Table 2: Gender wise Distribution of Tobacco use among Study Participants (N=255)

Variables	Female n (%)	Male n (%)	Total n (%)
Ever tried cigarettes	30 (20.2%)	30 (28.02%)	60 (23.5%)
Current cigarette smokers	9 (6.08%)	13 (12.1%)	22 (8.6%)
Smoking in college premises	2 (1.3%)	4 (3.7%)	6 (2.4%)
Ever used smokeless tobacco	5 (3.3%)	13 (12.1%)	18 (7.1%)
Current use of smokeless tobacco	2 (1.3%)	4 (3.7%)	6 (2.3%)

Exposure to second-hand tobacco smoke and awareness about official policies banning tobacco

The prevalence of exposure to second-hand tobacco smoke at home was found to be 80 (31.3%), while the prevalence of exposure to second-hand tobacco smoke in public places was found to be 112 (43.9%). There was a statistically significant relationship found between tobacco use in medical students and exposure to second-hand tobacco smoke at home and in public places ($p < 0.05$). About 222 (87.1%) students reported that an official policy banning smoking was present for both college and hospital buildings, while 3 (1.2%) and 14 (5.5%) said that the policy was only for hospital buildings and for college buildings, respectively. Only a small number of students (6.3%) said there was no official policy banning smoking. Although 222 students reported that there was an official policy present at the college banning smoking, only 214 (83.9%) said that the policy was enforced. The relationship between cigarette smoking and reporting that an official policy regarding the banning of smoking is enforced was found to be statistically significant. ($p<0.05$) (Table 3)

Attitude regarding tobacco use

The majority of the students (91.8%) responded by saying that tobacco sales to adolescents should be banned and that there should be a ban on advertising tobacco products (78.8%). Most of the medical students responded by saying that smoking should be banned in restaurants (91.4%), pubs and discos (63.9%), and enclosed public places (97.3%). (Table 3)

Role of health care professionals in tobacco cessation

The opinions of smokers vs. non-smokers in regard to health care professionals serving as "role models" for their patients were found to be statistically significant ($p<0.05$). The medical students who smoked were less likely to agree that health care professionals served as role models for their patients. The majority of the students (92.2%) responded by saying that a patient's chances to quit smoking increased if they received advice from a

Table 3: Association of Tobacco Use on Attitude of Medical Students towards Ban of Tobacco Products (N= 255)

Variable		Have used tobacco		Total	Chi-square	p-value
		Yes n(%)	No n(%)			
Should tobacco sales to adolescents be banned?	Yes	52 (20.3%)	182(71.4%)	234 (91.7%)	2.698	0.1
	No	8 (3.1%)	13 (5.1%)	21 (8.2%)		
Should there be a complete ban of the advertising of tobacco products?	Yes	49 (19.2%)	152 (59.6%)	201 (78.8%)	0.38	0.53
	No	11 (4.3%)	43 (16.9%)	54 (21.2%)		
Should smoking be banned in restaurants?	Yes	47 (18.4%)	186 (72.9%)	233 (91.3%)	16.922	<0.001*
	No	13 (5.1%)	9 (3.5%)	22 (8.6%)		
Should smoking be banned in discos/bars/pubs?	Yes	26 (10.2%)	137 (53.7%)	163 (63.9%)	14.42	<0.001*
	No	34 (13.3%)	58 (22.7%)	92 (36%)		
Should smoking in all enclosed public places be banned?	Yes	57 (22.3%)	191 (74.9%)	248 (97.2%)	1.49	0.22
	No	3 (1.2%)	4 (1.5%)	7 (2.7%)		

** P<0.05 = significant(Figures in the parenthesis are row wise percentages)*

Table 4: Association of Tobacco Use with Attitude of Medical Students towards Role of Health Care Professionals in Smoking Cessation (N=255)

Variable		Have used tobacco		Total N=255	Chi-square	p-value
		Yes n(%)	No. n(%)			
Do health professionals serve as "role models" for their patients and the public?	Yes	42 (16.4%)	166 (65.1%)	208 (81.5%)	6.98	0.008*
	No	18 (7.1%)	29 (11.3%)	47 (18.4%)		
Do health professionals have a role in giving advice or information about smoking cessation to patients?	Yes	57 (22.3%)	193 (75.7%)	250 (98%)	3.77	0.05*
	No	3 (1.2%)	2 (0.8%)	5 (2%)		
Are a patients chances of quitting smoking increased if a health professional advises him or her to quit?	Yes	51 (20%)	184 (72.1%)	235 (92.1%)	5.56	0.018*
	No	9 (3.5%)	11 (4.3%)	20 (7.8%)		
Should health professionals routinely advise their patients who smoke to quit smoking?	Yes	59 (23.1%)	192 (75.3%)	251 (98.4%)	0.005	0.94
	No	1 (0.4%)	3 (1.1%)	4 (1.5%)		
Should health professionals routinely advise their patients who use other tobacco products to quit using these products?	Yes	60 (23.5%)	192 (75.3%)	252 (98.8%)	0.93	0.33
	No	0 (0%)	3 (1.2%)	3 (1.2%)		

** P<0.05 = significant (Figures in the parenthesis are row wise percentages)*

health care professional. There was no major difference in the opinion of the students who smoked versus those who did not, in regard to health care professionals giving routine advice on smoking cessation. (Table 4)

Behaviour and Cessation

Among the current smokers, 15 (68.1%) students said that they have tried to quit smoking in the past year, and 4 (18.1%) responded by saying that they did not want to quit smoking. All six of the students who currently use smokeless tobacco responded by saying that they wanted to quit. Only nine (15%) students who were ever smokers said that they had received professional advice to help them quit smoking.

The majority of the medical students, 203 (79.6%) and 187 (73.3%) responded by saying that health care professionals who smoked and used smokeless tobacco, respectively, were less likely to advise their patients to stop the use of tobacco.

Discussion:

The use of tobacco, both for smoking and in smokeless forms, has multiple adverse health implications for both active and passive smokers. Medical students being the future of today can greatly help reduce the adverse health outcomes of tobacco use, but the use of tobacco products by medical students and health care professionals alike poses a major shortcoming.

Tobacco use among medical students

In this study, nearly a quarter of the medical students i.e. 60 (23.5%) had ever smoked cigarettes, which is lower than that found by Brar M et al (42%) in Pune[8] and Shrestha N et al (49.4%) in Kathmandu[9], but higher than studies done by, Patel J et al (22.6%) in Belgaum[10], Vankhuma C et al (9.3%) in Delhi[4], and Boopathirajan R et al (10.9%) in Chennai.[11] The findings of our study were similar to the pooled average of 21.95% found in a systematic review by Sahu A et al.[6]

Current cigarette smokers were 8.6% of the total, which is much lower than that reported by Brar M et al (7, 24.3%) in Pune,[8] Shrestha N et al (8, 30.1%) in Kathmandu[9], and Patel J et al (9, 24.2%) in Belgaum.[10]

Most of the students in this study i.e. 25 (9.8%) had tried their first cigarette between the ages of 20 and 24, which is similar to the findings by Shrestha N et al in Kathmandu[9] and Patel J et al in Belgaum.[10] A study done by Brar M. et al in Pune[8] stated that most of the students started smoking before the age of 20. The high academic stress and demands of medical school could be one of the probable causes for students starting to smoke between the ages of 20 and 24. This study also found that 6.2% of students had tried their first cigarette before the age of 16, which emphasises the need for setting up counselling and regular health checkups at the primary and secondary school levels to address the factors that could have led to cigarette use. There should also be regular sessions conducted at schools to make students aware of the hazards of tobacco use.

In the current study, 18 (7.1%) of students had used smokeless forms of tobacco, while 6 (2.3%) were currently using smokeless tobacco, which was less than a study done by Brar M et al in Pune[8] and Patel J et al in Belgaum,[10] but more than a study done by Shrestha N et al in Kathmandu[9] and Boopathirajan R et al in Chennai.[11]

Exposure to second-hand tobacco smoke

In this study, about one-third i.e. 80 (31.3%) of students were exposed to second-hand tobacco smoke at home, while nearly half i.e. 112 (43.9%) were exposed to second-hand tobacco smoke in public places, which is less than that found by Brar M et al in Pune[8] and Boopathirajan R et al in Chennai.[11] Although in this study the exposure to second-hand tobacco smoke was less than that compared to other similar studies, the prevalence of exposure to second-hand tobacco smoke was higher than active smoking. This emphasizes the need for health education campaigns to make the community aware of the hazards of passive smoking in order to protect the innocent bystanders against its harmful effects.

The official policy banning tobacco on campus

Six (2.4%) students had smoked on college or hospital premises, while 4 (1.6%) had used smokeless forms of tobacco on campus. The majority of the students 222 (87.1%) were aware of an official policy against smoking on campus, and 214 (83.9%) responded by saying that the policy was enforced. This finding was higher than that reported by Brar M et al in Pune[8] and Mahadeva DM et al in Bengaluru[12] who found that a slightly lower number of students were aware of the official policy against tobacco on campus. The lower proportion of medical students smoking on college premises could be due to the presence and enforcement of the official policy against smoking on campus.

Attitude towards sales of tobacco products and smoking

In this study, majority i.e. 234 (91.7%) of students agreed that there should be a ban on the sale of tobacco products to adolescents. The majority of the students, i.e. 233 (91.3%) favoured the ban on smoking at restaurants and in enclosed public places 248 (97.2%). These findings are similar to studies done by Brar M et al in Pune[8], Shrestha N et al in Kathmandu[9], and Boopathirajan R et al in Chennai.[11] A little over three-fourths of the students favoured

the ban on advertising tobacco products 201 (78.8%), which is less than that reported by Boopathirajan R et al in Chennai[11] but similar to the findings of Shrestha N et al in Kathmandu.[9]

Even though most of the students supported the ban on the sale of tobacco products to adolescents and smoking at restaurants and enclosed public places, only a little over half of the students i.e.163 (63.9%) supported the ban on smoking at discos and pubs. These findings were similar to those of a study done by Shrestha N. et al in Kathmandu.[9]

Attitude towards the role of health care professionals in tobacco cessation

Most of the medical students i.e. 208 (81.6%) responded that health care professionals serve as "role models" for their patients and the public. Almost all the students (98%) agreed that health care professionals have a role in giving advice regarding smoking cessation and 98.4% said that health care professionals should routinely give advice to their patients who smoke and (98.8%) use smokeless tobacco products to quit using these products. Majority (92.2%) of the students responded saying that a patient's chances of quitting smoking increased if they received advice from a health care professional. Similar findings were found in studies done by Shrestha N. et al in Kathmandu.[9] This is a positive finding, as it showed that regardless of the smoking status, medical students were of the opinion that health care professionals should routinely advise their patients to quit the use of tobacco products.

Behaviour and Cessation

Over two-thirds of the medical students who were current smokers i.e. 15 (68.1%) said that they tried to quit smoking in the last year, but only 15% of the students who had ever tried tobacco products reported that they received professional help or advice to help them quit. This finding shows that there is a deficiency in reaching these medical students, even though more than half of them have tried quitting tobacco use.

Conclusion:

Almost a quarter of the students were found to have used tobacco or experimented with cigarette smoking at least once, while only 8% were found to be current smokers. Although the number of students who were current smokers was only 8%, it could be under reported. A large number of students were exposed to second-hand tobacco smoke both at home and in public places. Exposure to second-hand tobacco smoke can also be as harmful as active smoking, and even a brief exposure to second-hand tobacco smoke can cause severe damage. There needs to be strict enforcement of policies banning cigarette smoking in public places, and health awareness campaigns can be conducted to attempt to control smoking at home.

Most medical students (81.6%) agreed that health care professionals serve as "role models" for their patients and that their patients' chances of quitting smoking increased if they received advice from a health care professional (92.1%). The majority of the students responded that medical students who smoked (79.6%) or used other forms of tobacco (73.3%) were less likely to advise their patients to stop using tobacco.

Recommendation:

Medical students are the future of the health care system and it is for this reason that medical colleges should have a training program on tobacco cessation and counselling as a part of their regular curriculum. Medical colleges should also set up counselling sessions for medical students, which would serve the purpose of finding the cause behind students smoking along with other stressors that they may face.

Limitations:

Although this study used a self-administered anonymous questionnaire in order to maintain the anonymity and confidentiality of the study participants, there may have been some under reporting due to social desirability bias and reporting bias.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Mapping the Terrain of Learning: A Study on the Association between Self-Directed Learning Readiness and Learning Environment Dynamics among Students studying in a Public Health Institute at Kolkata, India

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Abstract:

Introduction: Self-directed learning (SDL) is the process in which individuals take the initiative and learning environment involves all other aspects of the institute. Good SDL ability is the foundation of lifelong learning. Students' perception of the educational environment plays a subtle role in learning and contributes to learning input and students' achievement. Self-directed learning is integral to public health teaching. **Objective:** To assess the perceptions of learning environment and self-directed learning readiness and association between the two among public health researchers and also to elicit the factors associated with SDLRS. **Method:** A cross-sectional study was conducted from July to December 2023 in a public health institute in Kolkata. A total of 102 participants across five courses were selected by Complete Enumeration method and their self-directed learning readiness (SDLRS) and perceptions of learning environment were assessed using a self-administered questionnaire. The data was analysed in SPSS, version 16. Ethical approval was taken. **Results:** The mean age of the study participants was 26.7 years and 64.7% of the study participants were from MBBS background. The median academic hours was 18 hours per week, 37.3% of the participants were studying in the institute for less than 6 months and 20.6% for more than 24 months. The overall perception of learning environment was more positive than negative. There was significant positive correlation between SDLRS and Learning Environment (Spearman's rho=0.281, p=0.004). Age (p=0.015) and prior academic qualification (p=0.016) were significantly associated with SDLRS. **Conclusion:** SDLRS was associated with positive Learning Environment. The overall perception of SDLRS was average and the SDL ability improved with duration of study in the institute and deteriorated with age of the study participants.

Keywords: Learning Environment, Medical Education, Public Health, Self-Directed Learning Readiness, Teaching Method

Introduction:

The medical education system in our country has a new role and a challenge in shaping competent medical professionals to meet the health needs of the rapidly changing society. It is a known fact that the passive unidirectional teaching-learning leads to non-facilitation of meta-cognitive skills, thus causing decreased students' engagement and motivation towards the course.[1] Self-directed learning (SDL) is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Ghosh S, Surendran S, Bandyopadhyay L, Sahu M, Basu R, Paul B. Mapping the Terrain of Learning: A Study on the Association between Self-Directed Learning Readiness and Learning Environment Dynamics among Students studying in a Public Health Institute at Kolkata, India. Healthline. 2024; 15 (1): 23-30
	DOI : 10.51957/Healthline_ 602_2024	

learning strategies, and evaluating learning outcomes.[2] However, it does not mean leaving the learner alone-rather he/she has the constant support of curriculum planners, institutions, teachers and peers. Self-directed learning is based on several core characteristics of adult learners viz. readiness to learn, knowledge of results, goal-directed learning, and independence to select learning tools and time.[3] The traditional education strategy is insufficient to meet the demands of dynamically changing medical science and the fast-growing medical field. SDL is crucial for public health researchers owing to their ever dynamic course curriculum. It helps researchers to keep up with rapidly evolving knowledge, fill knowledge gaps in specific areas relevant to their work, promotes innovation and creativity and empowers career development. The present Competency-Based Medical Curriculum for medical undergraduates and postgraduates in India emphasizes acquisition of a set of competencies for self-directed learning (SDL) through an explicit approach and dedicated teaching hours in the disciplines which gives the opportunity to develop skills for developing lifelong learners.[4] Self-directed learning is not solely important for students from medical background; it is a crucial skill for students across all disciplines and backgrounds to develop lifelong learning abilities, critical thinking, problem solving ability to navigate through complex issues, flexibility, adaptability, resourcefulness, independence and career advancement. Public health training is highly dynamic owing to the ever-evolving public health challenges and advancement in technology. Hence, students undergoing public health training need to develop SDL ability. The allied branches of public health like Nutrition and Veterinary Sciences are of equal importance with the advent of the concept of One Health which is the future, Hence, students from these disciplines also need to develop good SDL ability in order to collaborate with their peers from medical background and contribute to the field of public health.

The education environment is everything that happens inside an institution, including the learning environment, perception of infrastructure, interaction between students and classmates, teachers' attitudes and skills, and many other related factors.[5] A learning environment is defined as the social, psychological and pedagogical contexts in which learning occurs.[6] The Learning environment is an important factor in enriching students' learning because it plays a central role in learning and contributes positively to students' achievement, satisfaction and success.[7] Students' perception of the learning environment plays a subtle role in learning and contributes positively to learning input and students achievement, which can stimulate students' interest in learning and affect their motivation.[8] Maslow's hierarchy of needs states that an encouraging learning environment is the result of promoting the learner's needs more than the content of the materials, and by meeting diverse needs and expectations.[9]

Public health researchers are expected to cultivate the habits of SDL and develop lifelong learning skills at the institute.[10] The study therefore aims to assess the perceptions of learning environment and levels of self-directed learning readiness and its factors among public health researchers. The learning environment and SDL ability are multidimensional, and our study also aims to establish an association between the two.

Method:

Study design, setting, participants:

An institution based observational study of cross-sectional design was conducted from July 2023 to December 2023 in a renowned public health institute in Kolkata among students studying in various courses viz. MD Community Medicine, MD MPH Epidemiology, Diploma Dietetics, MSc Nutrition and Masters in Veterinary Public Health (MVPH) in the institute. The students from non-medical background have also been included in the study

because they are all part of a public health institute and are engaged in public health research, activities and collaboration.

Sample size and sampling:

Using standard formula, $N=Z^2 (SD)^2/d^2$, considering standard normal deviate at $\alpha=0.05$ and 95% CI as 1.96 and from a previous study conducted by Tang et al[5], SD=12.12 and precision 2.4 on either side of the SD the final sample size comes out to be 97. However, all the 102 students studying in the various courses in the institute were selected by Complete Enumeration Method. Those who did not give informed written consent were excluded from the study.

Data Collection, Study Tools, and Parameters Used:

The study was conducted with the help of a pre-tested, pre-designed structured validated Google form based self-administered questionnaire. Prior permission for using the tools were obtained from the authors. The tool was pre-tested among 10 similar researchers outside the study settings. The schedule encompassed the following domains:

a. Background information of the researchers (age, gender, course details, academic hours per week, prior academic qualification and availing hostel facility or not)

b. DREEM tool for assessing perceptions of Learning Environment.[12] The DREEM tool had 5 domains with statements on a 5-point Likert Scale: (Strongly agree=4, agree=3, neutral=2, disagree=1 and strongly disagree=0). However, 9 out of the 50 items which had negative statements were scored in a reverse manner. The various domains of the DREEM tool are: Students' Perception of Learning (SPL), Students' Perception of Teachers (SPT), Student's Academic Self Perception (SASP), Students' Perception of Atmosphere (SPA) and Students' Social Self Perception (SSSP). The cumulative score was categorised as: 0-50: very poor, 51-100: plenty of problems, 101-150: more positive than negative and 151-200: excellent.

c. SDLRS tool for assessing the levels of Self-directed learning readiness.[13] The SDLRS tool had 3 domains which had statements scored as follows:

1= Almost never true of me; I hardly ever feel this way

2=Not often true of me; I feel this way less than half the time

3=Sometimes true od me; I feel this way about half the time

4=Usually true of me; I feel this way more than half the time

5=Almost always true of me; there are very few times when I don't feel this way

The three domains of SDLRS are: Self-management ability, Information capability and Cooperative Learning ability. The cumulative score was categorised as 58-201: below average, 202-226: average and 227-290: above average.

Data Analysis:

Quantitative data was analysed using Microsoft Excel 2016 and Statistical Package for Social Sciences software (version 16). Descriptive statistics for the predictor variables and the outcome variables were shown by frequency table, mean, median and interquartile range. Factors were then seen by test of significance (p-value<0.05) at 95% confidence interval. The association between self-directed learning readiness and perceptions of learning environment was seen with Scatter plot and Canonical Correlation Analysis which is a multivariate statistical model.[11]

Ethical Approval:

Permission was taken from Institutional Ethics Committee of the institute. Informed written consent

was taken from each participant before data collection. Confidentiality was maintained throughout the process.

Results:

Out of the 102 study participants, 56 (54.9%) belonged to the age group 26-30 years, 57(55.9%) were males, 52(51%) were from MD Community Medicine Course, 31(30.4%) from Nutrition courses, 14(13.7%) from MD MPH Epidemiology course, 5(4.9%) from MVPH course, 53 (51.9%) were in the first year of their course, 66(64.7%) were from MBBS background and 54(52.9%) were availing hostel accommodation. The median academic hours of the study participants was 18 hours per week.

The median scores obtained in the various domains of Self-Directed Learning Readiness (SDLRS) and Perceptions of Learning Environment are shown in Table 1.

The overall median score of self-directed learning readiness of the study participants belonged to average category and the overall median perceptions of learning environment score of the study participants belonged to more positive than negative category.

The association between SDL and Perceptions of Learning Environment is shown is Figure 1.

Canonical correlation analysis was done to establish the association across various domains of SDLRS and Perceptions of Learning Environment as shown in Figure 2.

The learning environment and SDL ability are multi-dimensional, and therefore it is difficult to directly evaluate the relationship between them and hence the canonical correlation analysis which is a multivariate statistical model was used to further study the association. Canonical correlation analysis shows that the domains of SDLRS and Learning Environment are associated with each other and the proportion of variance explained by the model is 78.02% with a correlation coefficient of 0.490. The canonical loadings of the various domains of SDLRS and Learning Environment are shown in Figure 2.

The relationship of SDLRS with duration of study in the institute and age is shown in Figure 3. The figure shows that with the increase in duration of study in the institute the scores gradually improve and vice versa occurs with age.

Factors associated with Self-Directed Learning Readiness:

Chi-square test was done to find out association of SDL with explanatory factors. Age and prior academic background were found to be significantly associated with SDL as shown in Table 2.

Table 1: Median Scores obtained in the various domains of SDLRS and Perceptions of Learning Environment (N=102)

SDLRS Domains	Maximum attainable scores	Median scores (IQR)
Self-Management Ability	140	100 (91.7,112)
Information Capability	90	64 (58,71)
Cooperative Learning Ability	60	39 (35,43)
Total Score	290	201 (186.7,224)
Learning Environment Domains	**Maximum attainable scores**	**Median scores (IQR)**
SPL	48	32 (25.7,38)
SPT	44	30 (24,36)
SASP	32	19 (16.7,23)
SPA	48	33 (27.7,38)
SSSP	28	16 (13,19)
Total Score	200	130 (109.7,149.3)

Figure 1: Correlation between SDLRS and Perceptions of Learning Environment

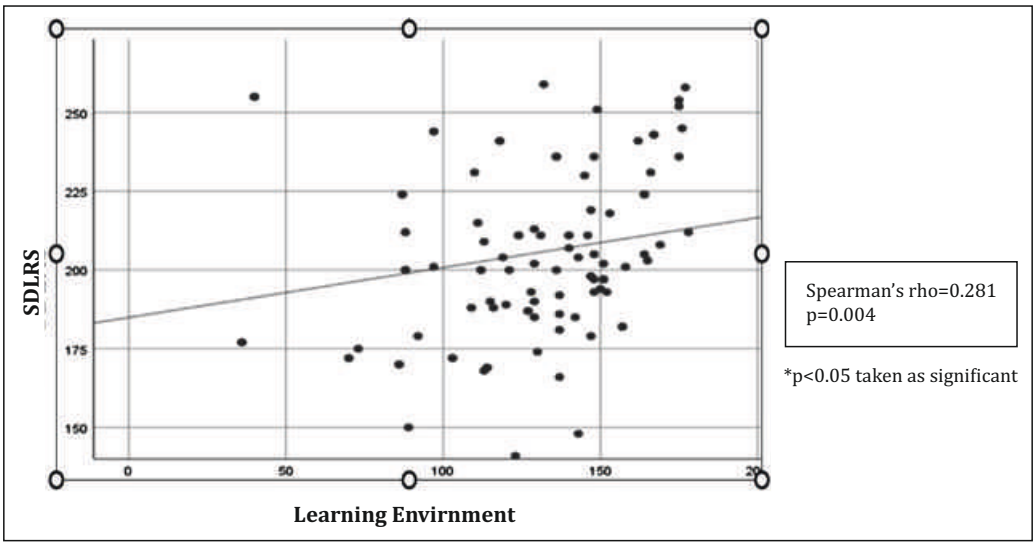

Figure 2: Canonical correlation across various domains of SDLRS and Learning Environment

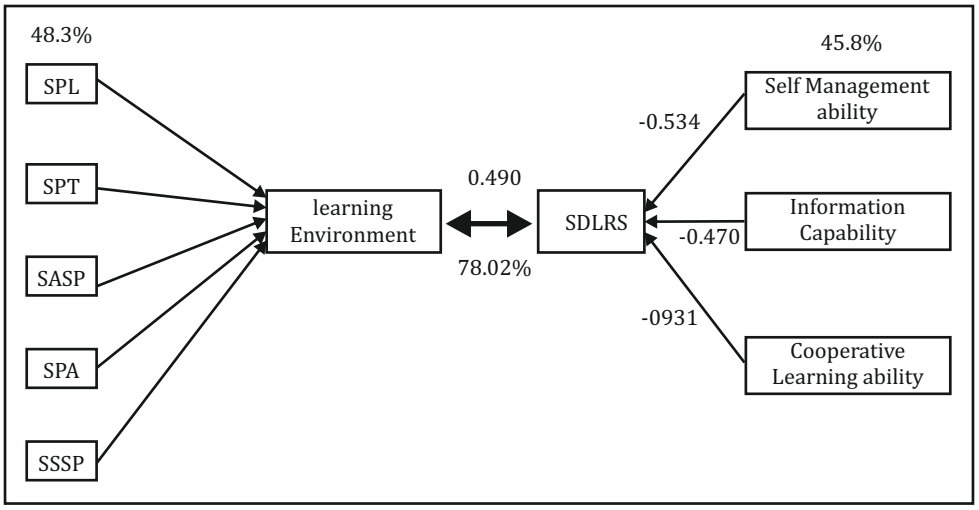

Figure 3: Relationship of various domains of SDL with duration of study in the institute and age

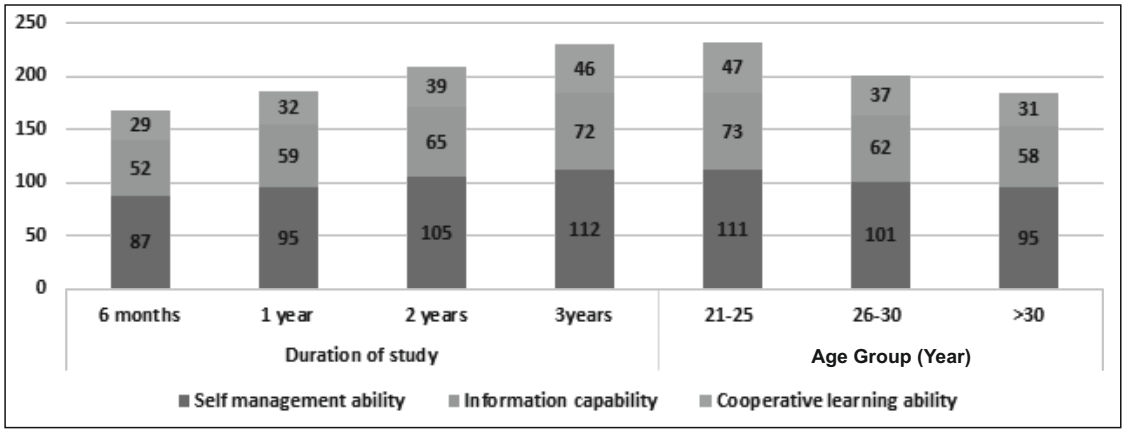

Table 2: Association of self-directed learning with explanatory factors (N=102)

Variables	SDLRS score		Chi-square statistic(df)	p-value
	Less than median score No. (%)	More than Median score No. (%)		
Age in years				
≤26	11 (32.4)	23 (67.6)	5.7(1)	0.015
>26	39 (57.4)	29 (42.6)		
Gender				
Male	31 (54.4)	26 (45.6)	1.5(1)	0.154
Female	19 (42.2)	26 (57.8)		
Academic hours/week				
≤18	23 (48.9)	24 (51.1)	0.1(1)	0.573
>18	27 (49.1)	28 (50.9)		
Place of accommodation				
Boarder	27 (50.0)	27 (50.0)	0.4(1)	0.495
Non-boarder	23 (47.9)	25 (52.1)		
Prior academic background:				
Non-medical	38 (57.6)	28 (42.4)	5.5(1)	0.016
Medical	12 (33.3)	24 (66.7)		

Discussion:

In this study, the cumulative median self-directed learning readiness score obtained by the study participants was 201 which belonged to average category. This finding aligned to the findings obtained in a study conducted by Premkumar et al.[14] The similarity in findings could be possibly due to the fact that both the studies were conducted mostly among students from medical background. However, this finding was contrary to the findings in a study conducted by Alradini et al[15] where the cumulative score obtained was 124. This difference can be attributed to the fact that this study was conducted among under-graduates whereas our study participants were public health researchers, so with increase in experience and expertise the scores of SDL improved. The scores in the domains of self-management ability and information capability were higher than cooperative learning ability. This finding was consistent with the findings obtained in a study by Tang et al.[5]. This may be due to the fact that public health researchers in the institute are engaged in various trainings and workshops which enhanced their management and information capabilities The uniqueness of the study institute is that all courses irrespective of their background have to go through a period of core course in their first semester where students across various disciplines collaborate and participate in group learning activities, seminars and discussions in various domains of public health which improve their domains of SDL Age and prior academic background were found to be significantly associated with SDL. A study conducted by Slater et al[16] showed similar findings. This may be attributed to the fact that in both the studies, the majority of the participants were in their first year of course curriculum. Thus, with increased age, SDL ability decreases and since the MBBS curriculum which is structured and has multiple hands on and group activities, there are areas in the curriculum where SDL is fostered thus increasing the SDL ability in students from medical academic background.

The overall perception of Learning Environment of the study participants was more positive than negative. This finding was consistent with the findings obtained in studies conducted by

Stormon et al[17] and Esan et al.[18] The students were generally satisfied with their learning environment. The public health researchers had highest rate for SPT and the lowest rate for SASP and SSSP, similar to the findings obtained by Tang et al.[5] This may be related to the teaching reforms in the institute, including a significant adjustment to teaching content and methods in recent years.[19] However, SSSP had the lowest score rate, followed by SASP, for all participants. This may be explained by the fact that the students have been engaged in passive receptive learning and rely on mechanical memory, an inefficient learning technique of rote memorisation to cope with the exams.[20] Sahu et al [21] reported that the SSSP significantly correlates with subjective happiness and suggested that institutions should promote not only students' academic development but also their happiness by fostering an appropriate educational environment. Although , the overall learning environment was perceived more positive than negative by the study participants, the individual domains need to be looked into for further restructuring.

The study found out significant positive correlation between SDL ability and perceptions of learning environment similar to the findings obtained in a study by Tang et al.[5] The learning environment is a major driving force for self-directed learning. Sayed et al[22] showed that a collaborative, academic and supportive environment might increase the participation of students, while an environment of competition, pressure or threats might reduce their motivation to learn and weaken their interests in the learning process. In recent years, public health institutes have tried to incorporate substantial changes in the course curriculum to improve the learning environment and inculcate SDL ability among the students. However, traditional academic structures may not effectively promote SDL, and there is growing recognition of the importance of an academic climate or environment for students to learn effectively.[23] Thus the above findings indicate that changing some aspects of the learning environment can improve the overall motivation to learn and in turn increase the SDL ability among the participants.

There were some limitations of the study. The study involved participants across various courses and in different years of their course to get a broader picture and see the effect of duration of study with SDL. However, the duration of study might influence their perceptions of SDL owing to their lack of knowledge on the same in the initial years of their course curriculum. The study involved participants from diverse backgrounds which was not studied before in previous studies owing to the unique nature of the institute where students from diverse backgrounds get trained in various aspects of public health and research. The study was conducted in a selected public health institute in Kolkata so the results may not be generalisable. The study tool was a google form based questionnaire, so there may be some bias in capturing the perceptions of the study participants.

Conclusion:

The overall SDL ability was average and perception of learning environment was more positive than negative among the study participants. There was significant positive correlation between SDL ability and learning environment. The SDL ability improved with duration of study in the institute and deteriorated with age of the study participants. The teachers need to adopt more innovative teaching and learning methods which are more student centered. The following measures can be taken to improve the SDL ability and learning environment- peer learning and collaboration, utilisation of latest technology in teaching, goal setting and planning and promoting a culture of lifelong learning. By implementing these recommendations, public health research institutions can empower their researchers to take ownership of their learning and professional development, ultimately leading to enhanced research outcomes and advancements in the field of medicine. The SDL ability has to be inculcated from the initial days of admission in the institute through regular group activities and assignments monitored

by the experts in the institute to bring about positive changes in their perceptions and transform the researchers into lifelong learners. The unique collaborative learning called core course practiced in the institute in the first semester can be adopted across institutes to foster better SDL.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Identifying Typical Presentations of Vitamin B-12 Deficiency among Individuals Attending Tertiary Care Hospital in Central Gujarat: A Case Control Study

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Abstract:

Introduction: Vitamin B12 is mainly obtained through non vegetarian diet, milk and milk products. Malabsorption and inadequate intake leads to haematological and neurological disorders. **Objective:** To determine the symptoms and signs associated with Vitamin B12 deficiency. **Method:** A case control study was conducted at the medicine department of tertiary care hospital. Patients visiting hospital with serum Vitamin B12 level below 200pg/ml were labelled as cases and more than 200 pg/ml were labelled as controls, irrespective of signs and symptoms of Vitamin B 12 deficiency.Controls were matched for age to minimize confounding. 160 cases and 160 controls were selected. Pretested semi structured questionnaire was used to identify signs and symptoms of Vitamin B12 deficiency among cases and controls. Chi square test was applied for each symptom between cases and control, of which 10 were significant ($p<0.05$). ROC curve was plotted for the 10 symptoms to check their usefulness for diagnosing vitamin B12 deficiency. **Results:** Area-Under Curve (AUC) was maximum under knuckle pigmentation (0.794), (Positive Likelihood Ratio (PLR)=3.24) followed by poor memory (0.684), (PLR=3.25) tingling and numbness (0.624), (PLR=1.84) and dizziness (0.605), (PLR=1.38) in respective order. Whereas fatigue, sore and swollen tongue, pale skin, breathlessness, palpitation, insomnia, memory loss were not associated with Vitamin B12 deficiency($p>0.05$). **Conclusion:** Presence of knuckle pigmentation, poor memory, tingling and numbness, and dizziness can be defined as hallmarks of Vitamin B12 deficiency and can be used to predict and start Vitamin B12 supplementation.

Keywords: Diagnostic algorithm , India, Tertiary hospital, Vitamin B-12 deficiency

Introduction:

Vitamin B12 is required in the production of red blood cells for their healthy cell growth and repair, its deficiency causes anaemia, which is manifested by easy fatigability, weakness, loss of appetite and weight loss. It also has vital role in the synthesis of DNA, the genetic material, as well as necessary for myelin formation, in combination with folic acid, thus maintaining neurological system. In the absence of VitaminB12 abnormalities develops characterised by impaired memory, tingling and numbness in finger and toes. It also presents with disorientation, frequent mood changes, irritability, depression, sometimes leading to dementia and psychosis.[1]

Cyanocobalamin deficiency is one of the commonest deficiencies and is associated with

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Patel S, Makwana A, Gandhi A, Chugh L, Bhavsar V. Identifying Typical Presentations of Vitamin B-12 Deficiency among Individuals Attending Tertiary Care Hospital in Central Gujarat: A Case Control Study.Healthline. 2024; 15 (1): 31-39
	DOI : 10.51957/Healthline_ 590_2024	

hematologic, neurologic, psychiatric, cutaneous, gastrointestinal, and cardiovascular diseases, and it impacts individuals of all ages. As diet is the only main source of Vitamin B12, its malabsorption and inadequate intake leads to haematological and neurological disorders building a public health problem worldwide.[2] The prevalence of vitamin B12 deficiency is estimated to be 47% in India[3] which is significantly more as compared to 15-20% of elderly in the United Statesare B12 deficient.[4]

The recommended dietary allowance (RDA) for Vitamin B12 is 2.2mcg/day in men and women aged 14years and above. Most Vitamin B12 is obtained through ingestion of meat, liver, kidney, fish, chicken, egg, milk, curd, cheese, and the body stores remain for years.[5]

Person suffering from Vitamin B12 deficiency develops megaloblastic anaemia, a clinical condition characterized by abnormalities in red blood cells. Advance cases present with neurological abnormalities and sometimes psychiatric symptoms.[6]

Variable haematological, neuropsychiatric, and mucocutaneous abnormalities can be signs of vitamin B12 deficiency. Knuckle hyperpigmentation associated with vitamin B12 insufficiency has been seen, however typically these individuals present with systemic symptoms as megaloblastic anaemia, pancytopenia, or neurological impairments. It further emphasises how critical it is to identify this cutaneous symptom as an early indicator of vitamin B12 insufficiency, allowing the doctor to address the patient's condition before it results in severe brain consequences.[7]

Absence of Serum Vitamin B12 testing facilities at PHC and Sub-center levels, and at many district levels, sparked the motivation for this study. Through analyzing ROC curves and p-values, our aim is to anticipate signs and symptoms of Vitamin B12 deficiency and determine the feasibility of initiating treatment without blood tests at the periphery level.Present study was conducted to determine the signs and symptoms associated with Vitamin B12 deficiency.

Method:

The study was conducted after ethical clearance from *IECHR* (Institutional Ethical Committee for Human Research).

A case control study was conducted at a tertiary care hospital from November 2017 to June 2018. Cases were selected from medicine department of the hospital based on the serum Vitamin B12 level, less that 200pg/ ml irrespective of the signs and symptoms of Vitamin B 12 deficiency.[7]Controls were defined as those patients visiting the medicine departmentwith serum B12 level above 200pg/ml Irrespective of the signs and symptoms of Vitamin B 12 deficiency. Controls were matched with cases as per age group to minimize confounding.

Information was collected from both cases as well as controls during their hospital visits to medicine department. Written consent was taken prior to interviews, and information related to health effects due to Vitamin B12 deficiency like Sore swollen tongue, Dizziness, Tingling &Numbness, Difficulty in concentrating or poor memory, Indigestion, diarrhoea, constipation and Bloating, Weight loss, Cool extremities, Symptoms of fatigue, Insomnia, difficulty in walking and headache associated with Vitamin B12 deficiency were collected by using pretested semi structured questionnaire. [6]An attempt was made to look for symptoms and signs associated with the level of Vitamin B12. Individuals who had taken parental or oral Vitamin B12 within last six months and patients operated for gastrectomy, ilealmalabsorption, Crohn's disease, ileal resection, and diagnosed tapeworm infestation were excluded from the study.

A pilot study was conducted on 15 cases and 15 controls in tertiary care hospital, Vadodara to generate the data for calculation of sample size. By using OpenEpi software, 95% CI, 90 % power, Type I error 5%, ratio of cases to controls 1:1, percentage of

tingling and numbness among controls as 30%, and expected odds ratio for tingling and numbness as 2.2, sample size came out to be 155 in each group. So we have taken 160 cases and 160 controls for conducting case control study.

Cases and controls were matched by five years age group (Frequency matching). The process of data collection did not pose any potential risk or harm to the participants. Data safety and confidentiality was given due consideration by keeping the file containing identity related details password protected PID and the filled proforma was kept in lock and key accessible only to the researchers. Data was entered in Epicollect 5, extracted in Excel 2007 sheet, and was analysed using Epi Info ™ 7 software. Chi square test was applied to check for association between symptoms and Vitamin B12 deficiency ($p<0.05$) and odds ratio was calculated. ROC curve was plotted for those symptoms which were statistically significant by chi square to check their usefulness for diagnosing vitamin B12 deficiency.

Results:

Table 1 shows Socio demographic profite of the participants among cases and controls.

As mentioned in Table 2,knuckle pigmentation (OR=8.15, 95% CI=4.92 to 13.51,p =<0.001), Dizziness (OR=1.83, 95% CI=1.18 to 2.81, p=0.007), tingling and numbness (OR=2.70, 95% CI=1.70 to 4.30, p <0.001) Indigestion/ diarrhoea/ constipation and bloating (OR=2.05, 95%CI=1.16 to 3.61,p=0.013), weight loss (OR=2.03, 95%CI=1.18 to 3.69, p=0.02), cool extremities (OR=2.41, 95% CI=1.01 to 5.71, p=0.046), M.C.V $\geq$ 100 (OR=3.78, 95% CI=2.11 to 6.75, p =<0.001), Headache (OR= 1.81, 95%CI=1.09 to 3.033, p=0.022), Difficulty in walking (OR=2.87, 95% CI=1.65 to 4.98, p <0.001) were significantly associated with Vitamin B12 deficiency.

Fatigue, sore and swollen tongue, pale skin, breathlessness, palpitation, insomnia, memory loss was not statistically associated with Vitamin B12 deficiency ($p>0.05$ at 95% CI).

ROC curve analysis of the diagnostic tests of Vitamin B12 deficiency

The ROC curveused to estimate the accuracy of Knuckle pigmentation, poor memory or difficulty in concentration, tingling and numbness and dizziness as a diagnostic test.

The best predictor of Vitamin B12 deficiency was Knuckle pigmentation. For Knuckle pigmentation an area under the curve (AUC) was 0.794 (SE 0.026, 95% CI: 0.75-0.84), Significance level: P <0.001). An AUC of 0.79 (with a statistical significance of less than 0.05) means that is a good diagnostic test for B12 deficiency. Positive Likelihood ratio of knuckle pigmentation is 3.24. (Figure 1)

For tingling and numbness, we found an area under the curve of 0.624 (SE: 0.03, 95% CI: 0.57-0.68. Significance level: P<0.001). An AUC of 0.62 (with a statistical significance of less than 0.05) means that tingling and numbness a good predictor test for B12 deficiency. Positive Likelihood ratio of tingling and numbness is 1.84. (Figure 1)

Poor memory or difficulty in concentration was also a good predictor of Vitamin B12 deficiency. For poor memory or difficulty in concentration we found an area under the curve of 0.68 (SE 0.07, 95% CI: 0.63-0.73, Significance level: P<0.01). An AUC of 0.68 (with a statistical significance of less than 0.05) means that poor memory or difficulty in concentration is a good diagnostic test for B12 deficiency. Positive Likelihood ratio of that poor memory is 3.25. Poor memory or difficulty in concentration is followed by tingling and numbness, which is also a good predictor of Vitamin B12 deficiency. (Figure 1)

Table 1: Socio demographic profile of the Cases and Controls (N=320)

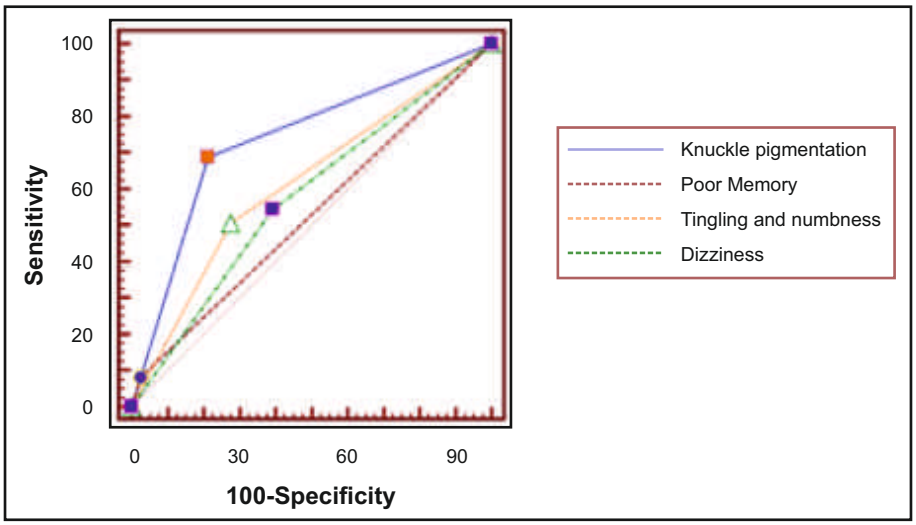
Variable	Cases (N=160)	Controls (N=160)	p value
	n(%)	n(%)	
Age(years)			
19-28	69 (43.12)	69 (43.12)	1
29-48	61 (38.12)	61(38.12)	
49 and above	30 (18.75)	30 (18.75)	
Mean age (SD)	35.37 (14.40)	35.33 (14.21)	-
Median age (IQR)	32.50 (23.50-45.00)	32.50 (23.50-45.50)	-
Gender			
Male	103 (64.4)	92 (57.5)	0.25
Female	57 (35.6)	68 (42.5)	
Religion			
Hindu	153 (95.6)	148 (92.5)	0.21
Muslim	6 (3.8)	12 (7.5)	
Jain	1(0.6)	0	
Occupation			
Professional	7 (4.4)	2(1.3)	<0.01
Semi-professional	6 (3.8)	2 (1.3)	
Clerical worker	11 (6.9)	6 (3.8)	
Skilled worker	17 (10.6)	6 (3.8)	
Semi-skilled worker	17 (10.6)	10 (6.3)	
Unskilled worker	32 (20.0)	34 (21.3)	
Unemployed	70 (43.8)	100 (62.5)	
Socioeconomic classification*			
Upper class	19 (11.9)	3 (1.9)	<0.001
Upper middle class	11 (6.9)	5 (3.1)	
Middle class	25 (15.6)	17 (10.6)	
Lower middle class	47 (29.4)	61 (38.1)	
Lower class	58 (36.3)	74 (46.3)	
Area of Residence			
Urban	71 (44.4)	45 (28.1)	<0.01
Rural	89 (55.62)	115 (71.9)	
Diet			
Vegetarian	39 (24.4)	18 (11.3)	<0.01
Other than Vegetarian	121(75.6)	142 (88.7)	

* Modified B.G.Prasad's socioeconomic classification-2018

Table 2: Distribution of participants according to various Symptoms of Vitamin B 12 deficiency and their comparison in cases and controls (N=320)

Variables	Cases n(%)	Controls n(%)	OR (95 % CI)	P value
Tingling and Numbness				
Yes	81 (50.6)	44 (27.5)	2.70	<0.001
No	79 (49.4%)	116 (72.5)	(1.70 to 4.30)	
Difficulty in concentrating				
Yes	13 (8.1)	4 (2.5)	3.44	0.034
No	147 (91.9)	156 (97.5)	(1.09 to 10.81)	
Dizziness				
Yes	87 (54.4)	63 (39.4)	1.83	0.007
No	73 (45.6)	97 (60.6)	(1.18 to 2.81)	
Indigestion, diarrhoea, constipationand Bloating				
Yes	41 (25.6)	23 (14.4)	2.05	0.013
No	119 (74.4)	137 (85.6)	(1.16 to 3.61)	
Weight loss				
Yes	36 (22.5)	20 (12.5)	2.03	0.02
No	124 (77.5)	140 (87.5)	(1.18 to 3.69)	
Cool extremities				
Yes	18 (11.3)	8 (5.0)	2.41	0.046
No	142 (88.8)	152 (95.0)	(1.01 to 5.71)	
Difficulty in walking				
Yes	52 (32.5)	23 (14.4)	2.87	<0.001
No	108 (67.5)	137 (85.6)	(1.65 to 4.98)	
Headache				
Yes	50 (31.3)	32 (20.0)	1.8182	0.022
No	110 (68.8)	128 (80.0)	(1.09 to 3.0329)	
Knuckle pigmentation				
Yes	110 (68.8)	34(21.3)	8.15	< 0.001
No	50 (31.3)	126 (78.8)	(4.92 to 13.51)	
Mean corpuscular volume				
≥100	54 (33.75)	19(11.88)	3.78	< 0.001
<100	106 (66.25)	141 (88.12)	(2.11 to 6.75)	

Figure 1: Comparison of ROC curves for Vitamin B12 deficiency



*The dotted line indicates a test with no predictive power (AUC: 0.5).

ROC curve showing the sensitivity and specificity of dizziness for the diagnosis of Vitamin B12 deficiency. The dotted line indicates a test with no predictive power (AUC: 0.5).

Dizziness had the lowest area under the curve; 0.60 (SE 0.03, 95% CI: 0.55-0.66, Significance level: P<0.001). Dizziness is a fair predictor for Vitamin B12 deficiency. Positive Likelihood ratio of that dizziness is 1.38. (Figure 1)

Discussion:

Vitamin B12 is an important factor in metabolic pathway that produces myelin which surrounds the nerves in form of protection and insulation. Vitamin B12 deficiency causes nerve damage as a result of which tingling and numbness in hands and feet is a common symptom. For the purpose of estimating the accuracy of diagnostic ability of symptoms such as knuckle pigmentation, poor memory or difficulty in concentration, tingling and numbness and dizziness, ROC curve was plotted.

ROC curve showing the sensitivity and specificity of knuckle pigmentation, poor memory or difficulty in concentration, tingling and numbness and dizziness for the diagnosis of Vitamin B12 deficiency. Fatigue, sore and swollen tongue, pale skin, breathlessness, palpitation, insomnia, memory loss was not associated with Vitamin B12 deficiency (p>0.05 at 95% CI).

In present study, it was found that tingling and numbness was present 50.6% among cases while 27.5% among controls. The difference was statistically significant at 95% confidence interval. One study found that about 28% of people had neurological symptoms of Vitamin B12 deficiency, without any signs of anaemia. [8,9]

Statistically significant difference was present for dizziness among cases (54.4%) and controls (39.4%) at 95% confidence interval (OR=1.83, CI= 1.17 to 2.81, P<0.01).

Vitamin B12 deficiency affect nervous system so balance and co-ordination also affected. Making more prone to difficulty in walking and falling.

In present study, it was found that difficulty in walking was present 32.5% among cases while 14.4% among controls. The difference was statistically significant at 95% confidence interval (OR=2.87, CI= 1.65 to 4.98, P<0.01). Anaemia caused by Vitamin B12 deficiency can lead to feeling of breathlessness and dizziness. This occurs because body cannot get enough oxygen to all body cells sufficiently. A case study conducted by Ekabe et al.[10] revealed that complaints such as progressive burning painful sensations on the upper trunk, paraesthesia, and numbness of the upper and lower limbs were improved by oral therapy with Vitamin B12.

In present study, it was found that difficulty in concentrating or poor memory was present 8.1% among cases while 2.5% among controls. The difference was statistically significant at 95% confidence interval (OR=3.45, CI= 1.10 to 10.82, P=0.034). In a cross sectional study conducted in neurology department of Pakistan by ShaziaJatoi et al.[11] in 2020 showed that 18.3% of the subjects had poor memory.

J. David Spence[12] in his review article described that grey matter atrophy and cognitive decline was slowed by B12 therapy. As Vitamin B12 deficiency is commonly prevalent, often missed, and simply treated, it can reduce the risk of stroke and cognitive decline.

Arora et al[13] study concluded that a high prevalence of Vitamin D/B12 deficiencies among urban populations complaining pain of lower limb and have generalized weakness.

In Vitamin B12 deficiency tongue changes colour and shape, making it painful, red and swollen. Statistically significant difference was not found for sore and swollen tongue among cases (6.9%) and controls (6.9 %) at 95% confidence interval (OR=1, CI= 0.42 to 2.38, P= 1). Studies had shown that a swollen and inflamed tongue that has long straight lesions on it could be an early sign of Vitamin B12 deficiency.[14]

In present study, it was found that experience of cool extremities was present 11.3% among cases while 5% among controls. The difference was statistically significant at 95% confidence interval (OR=2.40, CI= 1.01 to 5.71, P=0.046).

In present study, it was found that headache was present 31.3% among cases while 20.0% among controls. The difference was statistically significant at 95% confidence interval (OR=1.81, CI= 1.09 to 3.03, P=0.02).

B12 deficiency can manifest in various neuromuscular and gastrointestinal complaints. Peripheral neuropathy, glossitis, and gastrointestinal disturbances such as diarrhoea are commonly reported symptoms. Additionally, individuals may present with headaches and neuropsychiatric disturbances, reflecting the impact of B12 deficiency on neurological function.[15]

In present study, it was found that knuckle pigmentation was present 68.8% among cases while 21.3% among controls. The difference was statistically significant at 95% confidence interval (OR=8.15, CI= 4.91 to 13.51, P<0.01)

Srivastava et al[7] discovered well-demarcated areas of pigmentation localized to the knuckles of both hands in a 29-year-old female on a strictly vegetarian diet. After two months of Vitamin B12 oral therapy, the pigmentation began to regress.

Statistically significant difference was found for 33.75% cases with mean corpuscular volume more than100 and 11.88 % controls at 95% confidence interval (OR=3.78, CI= 2.12 to 6.75, P< 0.01).

In this study it was observed that knuckle pigmentation is the best predictor of Vitamin B12 deficiency, with area under the ROC curve of 0.794, followed by Poor memory or difficulty in concentration with area under the ROC curve of 0.684 and tingling and numbness with area under the ROC curve of 0.624. Dizziness had the lowest area under the ROC curve of 0.605. Dizziness is a fair predictor for Vitamin B12 deficiency.

Yajnik C.S. et al,[16] isolated adolescents with Vitamin B12 deficiency and administered an approved physiological dose of 2mg/day for 11 months and demonstrated improvement in pseudomotor function in feet by 14.7%, sensory conduction velocity in median and sural nerves by 16.2% and 29.4% respectively. In their study supplementation of physiological dose helps tackle widely prevalent vitamin B12 deficiency in Indian population with inadequate dietary intake.[16] The objective of study was to know the symptoms associated with Vit B12 deficiency, but further study is required to see the effect of physiological vitamin

B12, or therapeutic sublingual tabletsor injectable vitamin B 12 on the deficiency.

In this study symptoms like fatigue and difficulty in walking showed no association with Vitamin B12 deficiency. No association found in depression, insomnia, cool extremities and memory loss. Age, sex, religion and diet were possible confounders in our study. Body doesn't have enough Vitamin B12 to make red blood cells, which transport oxygen throughout your body. Vitamin B12 deficiency can lead to fatigue. This happens because body cannot get enough oxygen in the all cells of body sufficiently.

As per authors knowledge, there is limited literature available on this topic. Since we excluded the other possible causes of Vitamin B12 deficiency such as patients operated for gastrectomy, ileal malabsorption, Crohn's disease, ileal resection, and diagnosed tapeworm infestation; this becomes the strength of our study. But we did not measure homocysteine levels and methylmalonic acid and since the study is conducted in a tertiary care hospital, this is the limitation of our study and further field-based studies with a larger sample size are required.

Screening of Vitamin B12 deficiency based on the common signs and symptoms such as knuckle pigmentation, tingling and numbness and dizziness as found in this study may be useful where Vitamin B12 estimation is not feasible or cost effective. Community based screening and there by early diagnosis of Vitamin B12 deficiency may prevent neurological manifestations. Studies may be undertaken with regards to community-based screening based on common sign and symptoms found in this study.

Conclusion:

The most common symptoms associated with Vitamin B12 deficiency were tingling and numbness, poor memory, dizziness and the most common sign associated with Vitamin B12 deficiency was knuckle pigmentation.

Recommendation:

People with knuckle pigmentation, poor memory, tingling and numbness or dizziness should consume foods fortified with Vitamin B12 or oral or parenteral Vitamin B12 supplementation.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Out-of-pocket Expenditure and its Impact on the Quality of Life among Patients Attending the Anti-retroviral Therapy Centre of a Tertiary Care Hospital in Kolkata, India

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Abstract:

Introduction: Out-of-pocket expenditure (OOPE) has a negative impact on Quality of life (QoL) of People Living with HIV (PLHIV)which can increase the risk of slipping into poverty. **Objective:** Primary Objective of this study was to estimate the burden of OOPE in seeking health care among HIV patients attending the Anti-retroviral therapy (ART) centre of a tertiary care hospital; and secondary objectives were to assess their QoL, to identify the association of socio-demographic characteristics with the OOPE & QoL and to find out the correlation between OOPE and QoL. **Method:** A cross-sectional study was conducted among 232 patients attending ART centre of a tertiary care hospital in Kolkata using a pre-designed, pre-tested, structured schedule. Multivariable binary logistic regression was done to identify the association of their socio-demographic characteristics and clinical profile with the OOPE and QoL. **Results:** About 41.4% of the study population rated their QoL as neither poor nor good, 18.9% rated as 'good'. All the participants reported OOPE; 20.7% in the form of direct health expenditure. Participants belonging to the age group 18-39 years, residing in a joint family, had family member infected with HIV and had associated co-morbidity were statistically significant covariates of direct health expenditure; whereas participants belonging to the age group ≥40 years, living in a joint family, involved in an unskilled occupation, and belonging to middle and lower middle were statistically significant covariates of poor QoL. **Conclusion:** OOPE was experienced by all participants. As per the study findings Qol was neither poor nor good among participants. With increase in OOPE, the QoL worsened.

Keywords: Anti-Retroviral Agents, Health Expenditure, Out-of-pocket Expenditure, Quality of Life

Introduction:

Globally there were 39.0 million [33.1–45.7 million] people living with HIV at the end of 2022 including around 1.5 million children (0–14 years old) and 37.5 million adults(more than 15 years).[1] New HIV infections (1.3 million) and AIDS-related deaths (630 000) have continued to decrease worldwide, which is closer to achieving Sustainable Development Goal (SDG) 3.3 of ending AIDS as a public health threat by 2030.[2] From 2010, deaths due to HIV have been reduced by more than half (51%) and globally HIV epidemic claimed 69%

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Rashid M, Goswami D, Ray K, Basu M, Mondal A, Dey A. Out-of-pocket Expenditure and its Impact on the Quality of Life among Patients Attending the Anti-retroviral Therapy Centre of a Tertiary Care Hospital in Kolkata., India. Healthline. 2024; 15 (1): 40-50
	DOI : 10.51957/Healthline_ 603_2024	

fewer lives in 2022 since the peak in 2004.Of the people living with HIV in 2022, 86% [73–>98%] knew their status, 76% [65–89%] were receiving treatment and 71% [60–83%] had suppressed viral loads. Worldwide 29.8 million PLHIV were receiving antiretroviral therapy.

In India, the HIV epidemic level is low with adult HIV prevalence of 0.20% and HIV incidence is 0.05 per 1000 uninfected population in 2022, about 24.67 lakh people living with HIV (PLHIV) and India is the second largest HIV epidemic country in the world, which accounts for 6.3% of all PLHIV.[3]

The availability and affordability of highly active antiretroviral therapy, especially after 2001, has led to significant improvement in the health status and survival of patients with HIV/AIDS.[4-6] By 2012, India achieved the highest reduction of new infections in the whole world (57%).[7] This is due to the provisioning of free-of cost consultations, routine investigations, along with antiretroviral and specific prophylactic therapies. Under NACP phase-V, PLHIV continue to have access to free diagnostic facilities; free first-line, second and third-line ART; prevention, diagnosis; and management of opportunistic infections including management of Tuberculosis (TB) with daily anti-TB treatment through a single window approach. As on March 2023, there were 34,515 HCTS facilities including 5,428 confirmatory facilities where a total of 3.39 crore of HIV testing were conducted in the country. The viral load suppression was at 93% among on-ART PLHIV who were tested for viral load in 2022- 23 which is higher than the 85% in 2021-22. It has significantly reduced the bulk of the direct health costs. National Health Policy acknowledges in its background analysis that 63 million persons are pushed to poverty every year due to healthcare costs.[8] This is mostly due to out-of-pocket (OOP) expenditure on health, which means spending on health care from household resources and income, predominantly through private healthcare facilities.

PLHIV have to cope with a range of HIV-related symptoms and a plethora of morbidities due to crippling immune system reduce QOL, thereby impairing their physical, mental, and social well-being.[9] The advent of highly active antiretroviral treatment (HAART) has changed the concept of HIV/AIDS from a deadly disease to a chronic manageable illness with focus shifted from fighting the virus to ensuring a good QOL.[10,11] Vihaan programme (2013) enhances treatment adherence and retention in HIV care for PLHIV in India. Despite the free availability of antiretroviral therapy in India, seeking care can still incur out-of-pocket (OOP) expenses, which may impact treatment compliance and outcomes. Indirect health-related and nonmedical costs have not been extensively studied, although they significantly contribute to the economic burden of accessing healthcare services and despite the known fact that a high economic burden in availing the services affects treatment compliance and outcomes. With this background a study was conducted to estimate the burden of out-of-pocket expenditure in seeking health care among HIV patients attending the ART centre of a tertiary care hospital in Kolkata; to assess their quality of life; to identify the association of their socio-demographic characteristics & clinical profile with the OOPE incurred in seeking health care & their QoL and to find out the correlation between OOPE and QoL.

Method:

Study type, design, setting and population:

This hospital-based study, cross-sectional in design was conducted over a period of 3 months, from May to July 2022, at the ART centre of IPGME&R and SSKM hospital Kolkata, West Bengal. The ART centre in question since its inception caters to 3598 PLHIV among them 1931 were alive and on ART. The study participants consisted of adult persons (18 years and more) who were infected with HIV, taking ART for more than 1 year and were currently on 1st

line ART at the ART centre of this institution. However, PLHIV who were not willing to participate excluded from the study.

Sample size and Sampling method

The sample size was calculated using the Cochran formula, $Z^2p\ (1- p)/d^2$, where p stood as the prevalence and d as the absolute precision for the calculation (5%). Taking p= 16.3% or 0.163 as proportion of poor quality of life from a study by Sarkar et al among male PLHA in West Bengal, India in 2019[9]; q(1-p) = 83.7% or 0.837; Standard normal deviate (Z_α) at 95% C.I= 1.96; Absolute error = 5%; the sample size was calculated as 210. However, presuming a non-response rate of 10%, a final sample size of 232 was planned. From the 1738 eligible PLHIV, 232 study participants were selected by systematic random sampling. Anti-retroviral drugs were usually given once in a month to the PLHIV. Each time before consultation they need to submit their treatment card to the reception of the centre, from these authors made the sampling frame. Authors ensured that there is no repetition.

Study tools and technique

A pre-designed, pre-tested structured schedule was used for the study comprising of socio-demographic and disease related variables (gender, education, occupation, type of family, socioeconomic status, coverage with any health insurance, any associated co-morbidities etc.); Health expenditure-related variables included – sources of expenditure; direct health expenditure (doctor's consultation fee, purchase of medicine, diagnostic charges, and hospital charges); indirect health expenditure (transportation charge, lodging charges, and loss of wages for both the patients and the family members).

Participants were interviewed using WHOQOL-HIV BREF 2012 (Field Trial Version)[12] questionnaire to assess QOL, which produces a profile with four domain scores and two individually scored items, rated on a 5-point Likert scale. Score of each domain as well as overall (total) is considered good if score is $\geq$ median of the maximum attainable score, both domain-wise and in totality. The mean score was transformed to 0–100 range. The parameters taken in each domain are as follows: physical health (domain 1), psychological health (domain 2), social relationship (domain 3), and environmental health (domain 4). The schedule was translated in Bengali (local language) and the latter was back translated into English by two different Subject matter experts to ensure reliability. The final Pretesting was done among 24 PLHIV who were not included in the study. Face and content validity were ensured by the experts at the Department of Community Medicine and the final schedule was used for the study. Cronbach Alpha was 0.8. Authors had approached ART counsellors and with the help of them informed written consent was obtained from the participants.

Data Analysis

The data collected from the field were edited for any inconsistencies and appropriately coded, after which data were tabulated into Microsoft Excel 2019 and then imported to SPSS 25 for analysis. The categorical variables and proportions were represented by number (n) and percentage (%). Chi-square test was done to identify the association between socio-demographic characteristics and clinical profile of the participants with the OOPE and QoL. Correlation between OOPE and QoL was assessed using Spearman's rho or Spearman correlation coefficient. A p value of <0.05 was considered statistically significant.

Operational definitions and measurement of outcome variables:

1. The following definitions were used to measure the OOP health expenditure in relation to HIV:
   - **OOP health expenditure:** These are made by patients or their families at the point of receiving health services particularly in relation to HIV in the last 3 months.
   - **Direct health expenditure:** It includes

doctor's fee, purchase of medicine, diagnostic charges, and hospital charges. [13]

- **Indirect health expenditure:** It includes transportation charge, lodging charges, and loss of wages for both the patients and the family members. [13]
- **CHE (Catastrophic health expenditure):** It is defined as the household's health expenditure in relation to HIV when exceeds 10% of the total household income. [14]

2. As all the participants reported indirect form of health expenditure, authors have seen association with direct health expenditure which was categorized as present and absent.

Ethical considerations

Before the commencement of the study, utmost care was given to maintaining anonymity and confidentiality, especially as it involved patients with HIV/AIDS. The study received approval from the Institutional Ethics and Research Advisory Committee, IPGME&R, and SSKM hospital Kolkata, West Bengal. Permission was also obtained from West Bengal State AIDS Prevention and Control Society (WBSAPCS).

Results:

The final sample comprised of 232 PLHIV with 48.8% in the age group of 40-49 years; 63.8% were males;74.1% were Hindu; 79.3% from the general caste; 43.1% studied up to the primary level, more than half (55.6%) worked as unskilled workers; 56.9% were married and 84.5% belonged to nuclear families. About one-third of the participants (33.2%) were classified under the middle socioeconomic status according to the modified B. G. Prasad scale 2021. Furthermore majority (89.7%) of the participants were residing in urban areas. Nearly one-fifth (19%) had family member infected with HIV; 88% did not have any associated co-morbidities; 16 participants were diabetic and 9 were both diabetic and hypertensive and 77.6% had no health insurance coverage. 96 (41.4%) participants were taking ART for less than 5 years. 8 participants were currently taking anti-tubercular drug. 8% of the participants reported viral load more than 1000 copies. (Table 1)

Overall quality of life and general health:

About 41.4% rated their quality of life as neither poor nor good and only 18.9% replied with a positive rating of "good", one-fourth of the participants (24.1%) were dissatisfied, while 29.3% reported being satisfied. Additionally, 46.6% of the participants mentioned that they were neither satisfied nor dissatisfied with their health.

Physical health domain:

Most of the participants felt that physical pain prevented them from doing what they needed to do, with 48.3% experiencing little pain and 27.6% experiencing moderate pain. About one-third (37%) of the participants stated that they required some form of medical treatment to function in their daily life, although the majority reported having enough energy (60.3%). When it came to mobility, more than half (53.4%) of the participants were able to get around on an average level (neither poor nor good). As for sleep, 29.3% expressed being neither satisfied nor dissatisfied, while 55.1% were satisfied. Regarding their ability to perform daily living activities, 36.2% replied as neither satisfied nor dissatisfied, and 32.8% were satisfied. Additionally, more than one-fourth (27.6%) of the participants expressed satisfaction with their capacity for work, and 37.9% were neither satisfied nor dissatisfied. As per total score 55.2% of the patients rated their QoL as good in Physical health domain.

Psychological health domain:

The majority of the PLHA (46.5%) reported enjoying their life a little, and 43.1% enjoyed a moderate amount. Almost half of them (48.2%)

Table 1: Distribution of the study participants according to their socio-demographic characteristics and clinical profile (N=232)

Variables	Categories	n (%)
Age group (years)	18-29	36 (15.5)
	30-39	40 (17.2)
	40-49	112 (48.3)
	50-59	24 (10.3)
	60 and above	20 (8.7)
Gender	Male	148 (63.8)
	Female	80 (34.5)
	Third gender	4 (1.7)
Religion	Hinduism	172 (74.1)
	Islam	60 (25.9)
Caste	General	184 (79.3)
	Other Backward class	16 (6.9)
	Scheduled caste	32 (13.8)
Marital status	Married	132 (56.9)
	Unmarried	52 (22.4)
	Widowed/ Divorced/separated	48 (20.7)
Educational status	Illiterate	44 (19.0)
	Primary	100 (43.0)
	Secondary	44 (19.0)
	Graduate and above	44 (19.0)
Occupation	Unskilled	129 (55.6)
	Skilled	40 (17.2)
	Service	35 (15.1)
	Others	28 (12.1)
Family type	Nuclear	196 (84.5)
	Joint	36 (15.5)
Socio-economic status *	Upper (I)	23 (9.9)
	Upper Middle (II)	76 (32.8)
	Middle (III)	77 (33.2)
	Lower Middle (IV)	56 (24.1)
Type of residence	Urban	208 (89.7)
	Rural	24 (10.3)
Family member infected with HIV	Yes	44 (19)
	No	188 (81)
Associated co-morbidity	Yes	28 (12)
	No	204 (88)
Health insurance coverage	Yes	52 (22.4)
	No	180(77.6)

* As per Modified B. G. Prasad Classification 2021

found their life to be moderately meaningful, and an equal number (39.6%) replied that they were able to concentrate a little and a moderate amount. Regarding their bodily appearance, the majority (77.6%) of PLWHA reported being moderately able to accept it. Nearly one-fifth (18.9%) of PLWHA expressed moderate satisfaction with themselves, while 44.8% were neither satisfied nor dissatisfied with themselves. More than half (51.7%) of the participants were experiencing negative feelings such as a blue mood, despair, anxiety, and depression very often. As per total score 57.3% of the patients rated their QoL as good in psychological health domain.

Social relationship domain

One fourth (22.4%) of the participants were dissatisfied with their personal relationship, whereas 62% and 12% expressed being neither satisfied nor dissatisfied and satisfied, respectively. Regarding their sex life, higher dissatisfaction (24.1%) was reported, while 50% and 22.4% stated being neither satisfied nor dissatisfied and satisfied, respectively. When it came to social support from friends, the majority (72.4%) mentioned feeling neither satisfied nor dissatisfied. As per total score 57.3% of the patients rated their QoL as good in social relationship domain.

Environmental health domain

The majority (60.3%) of the participants felt moderately safe in their daily life. When it came to their physical environment, most of them (79.3%) considered it healthy, and 8.6% found it to be very healthy, while one fifth (17.2%) perceived it as only a little healthy. In terms of financial resources, nearly two-thirds (61%) had a little money, while 31% possessed a moderate amount. For daily information, more than one-third (36.2%) had access to a little, while 55.1% had access to a moderate amount. When it came to leisure activities, more than one-third (37.9%) had moderate opportunities, while 51.7% had limited scope. Only a small percentage (6.9%) were dissatisfied with the condition of their living place, while 58.6% expressed neither satisfaction nor dissatisfaction, and 31% were satisfied. In relation to access to health services, the majority (74.1%) were satisfied, and a large number (65.5%) expressed satisfaction with their transportation options. As per total score only 35.5% of the patients rated their QoL as poor in Environmental health domain.

Table 2 showed that over 20% of patients experienced direct health expenditure, with investigations being the category with the highest expenditure. All participants faced indirect health expenditure in the form of transportation costs. The median out-of-pocket expenditure (OOPE) among patients with HIV who were taking ART was Rs. 300 (IQR: 170–550), and the median indirect health expenditure was Rs. 285 (IQR: 100-400). In This study, the out-of-pocket expenditure was considered catastrophic for 5.1% (12/232) of households.

Table 2: Distribution of the study participants according to their out-of-pocket expenditure (N=232)

Out-of-pocket Expenditure	Present n(%)	Absent n(%)
A. Direct health expenditure	48 (20.7)	184 (79.3)
Purchase of Medicine	8 (3.4)	224 (96.6)
Investigations	40 (17.2)	192 (82.8)
B. Indirect health expenditure	232 (100.0)	-
Transportation	232 (100.0)	-
Loss of wages of patient	148 (63.8)	84 (36.2)
Loss of wages of attendant	4 (1.7)	228 (98.3)
Food	16 (6.9)	216 (93.1)

Table 3 presented the mean scores ± SD of the patients on various domains and facets of WHO QOL BREF. The physical health score was 56.4 ± 15.6, psychological health was 46.2 ± 13.4, social relationship was 48.9 ± 13.8, and environmental health was 54 ± 10.5. The highest median score was observed in the physical health domain, i.e., 56 with an interquartile range of 44–69, and the lowest was in the psychological health domain, i.e., 44 with an interquartile range of 38–56.

Chi-square test was done to identify association between socio-demographic characteristics and Clinical profile and direct health expenditure. Univariable logistic regression performed between statistically significant independent variables and direct health expenditure found that age group 18-39 years, residing in a joint family, family member infected with HIV and associated co-morbidity had statistically significant higher odds of direct health expenditure than the references.(Table 4)

Multivariable logistic regression model showed that that age group 18-39 years, residing in a joint family, family member infected with HIV and associated co-morbidity) were statistically significant covariates of direct health expenditure. (Table 4) (Multicollinearity do not exist; Tolerance value <0.10 or Variance inflation factor >10 indicate multicollinearity)

Table 5 Chi-square test was done to identify association between Sociodemographic characteristics and Clinical profile and QoL. Univariable logistic regression performed between the statistically significant independent variables (Sociodemographic characteristics and clinical

Table 3: Descriptive statistics of domain wise transformed score (0-100) of WHO quality of life-BREF (N=232)

Domains	Attained Transformed Score		Mean ± SD	Median (IQR)
	Minimum	Maximum		
Physical health	25	94	56.43 ± 15.58	56 (44-69)
Psychological health	13	81	46.16 ± 13.38	44 (38-56)
Social relationship	25	94	48.97 ± 13.78	50 (44-50)
Environmental health	31	88	54.09 ± 10.47	50 (50-63)

SD=Standard Deviation, IQR=Interquartile range

Table 4: Binary logistic regression Showing Factors Associated with Direct Health Expenditure (N=48)

Variables	Categories	Direct health expenditure (present) n (%)	OR (95% CI)	P-value	aOR (95% CI)	P-value
Age group	18-39 years	24 (50)	2.53 (1.32-4.86)	0.005	3.93 (1.79-8.60)	0.001
	≥40 years	24 (50)	Ref	-	Ref	-
Family type	Nuclear	36 (75)	Ref	-	Ref	-
	Joint	12 (25)	2.22 (1.02-4.85)	0.045	2.48 (1.05-5.87)	0.039
Associated co-morbidity	Yes	16 (33.3)	7.16 (3.09-16.57)	<0.001	16.62 (5.85-47.17)	<0.001
	No	32 (66.7)	Ref	-	Ref	-
Family member infected	Yes	4 (8.3)	3.05 (1.04-9.01)	0.043	12.22 (2.37-62.96)	0.003
	No	44 (91.7)	Ref	-	Ref	-

Omnibus test P-value: 0.000, Nagelkerke R^2: 0.288, Hosmer Lemeshow P-value: 0.951

Table 5: Binary logistic regression showing factors associated with poor QoL (N=115)

Variables	Categories	Poor QoL n(%)	OR (95% CI)	p-value	a OR (95% CI)	P-value
Age group	18-39 years	20 (17.4)	Ref	-	Ref	-
	≥40 years	95 (82.6)	4.36 (2.38- 7.97)	<0.001	7.015 (3.18-15.43)	<0.001
Socio-economic status	Upper middle	23 (20)	Ref	-	Ref	-
	Middle	56 (48.7)	8.81 (4.44-17.47)	<0.001	3.662 (1.56-8.55)	0.003
	Lower middle	36 (31.3)	5.94 (2.89-12.20)	<0.001	2.661 (1.10-6.42)	0.029
Occupation	Service	8 (7)	Ref	-	Ref	-
	Unskilled	83 (72.2)	6.09 (2.55-14.49)	<0.001	3.992 (1.35-11.72)	0.012
	Skilled	12 (10.4)	1.44 (0.51-4.08)	0.486	0.291 (0.07-1.23)	0.094
	Others	12 (10.4)	2.53 (0.85-7.51)	0.094	2.366 (0.58-9.52)	0.226
Type of family	Nuclear	87 (75.7)	Ref	-	Ref	-
	Joint	28 (24.3)	4.38 (1.90-10.10)	0.001	21.48 (5.21-88.48)	<0.001
Health insurance coverage	Yes	16 (13.9)	Ref	-	Ref	-
	No	99 (86.1)	2.75 (1.42-5.31)	0.002	2.206 (0.92-5.27)	0.075

Omnibus test P-value: 0.000, Nagelkerke R^2: 0.228, Hosmer Lemeshow P-value: 0.103

profile) and poor QoL found that age group ≥40 years, living in a joint family, not covered by health insurance, belonging to middle and lower middle class, and involved in unskilled type of occupation had statistically significant higher odds of poor QoL than the references.

However, multivariate logistic regression model showed that age group ≥40 years, involved in unskilled type of occupation, living in a joint family and belonging to middle and lower middle class were statistically significant covariates of poor QoL. (Table 3) (Multicollinearity do not exist; Tolerance value <0.10 or Variance inflation factor >10 indicate multicollinearity)

A very weak negative significant correlation between total OOPE and physical health, social relationship, and environmental health, respectively. However, there was no correlation between psychological health and total OOPE.

Figure 1 showed that almost half of the study participants (49.6%) reported their QoL as poor; 44.8%, 42.7%, 46.6% and 35.5% of the participants reported poor QoL in physical health, psychological, social relationship, and environmental health domain respectively.

Discussion:

The HIV positive persons experience a poor quality of life due to their illness. In addition, the financial burden due to OOPE can further worsen their QoL. Though there has been therapeutic improvements, indirect costs like transportation and loss of wages still represent a higher cost.[6]

In the present study, all participants faced indirect OOPE and direct health expenditure was only 20.7%. Alvi et al at Jawaharlal Nehru Medical College, Aligarh also demonstrated similar findings.[15]

All the participants faced indirect OOPE in the form of transportation costs and loss of wages which was similar to the study by Barennes et al at Lao People's Democratic Republic[4], Okere et al at Tanzania[16] and Adeniran et al at Nigeria[17] where the most notable OOPs were related to transportation and to loss of income.

Figure 1: Distribution of study participants according to the domains of QoL as per WHOBREF_QOL (N=232)

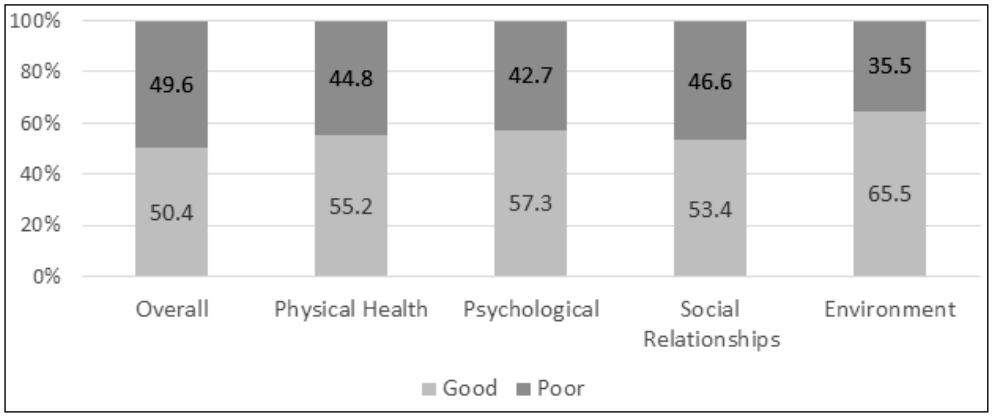
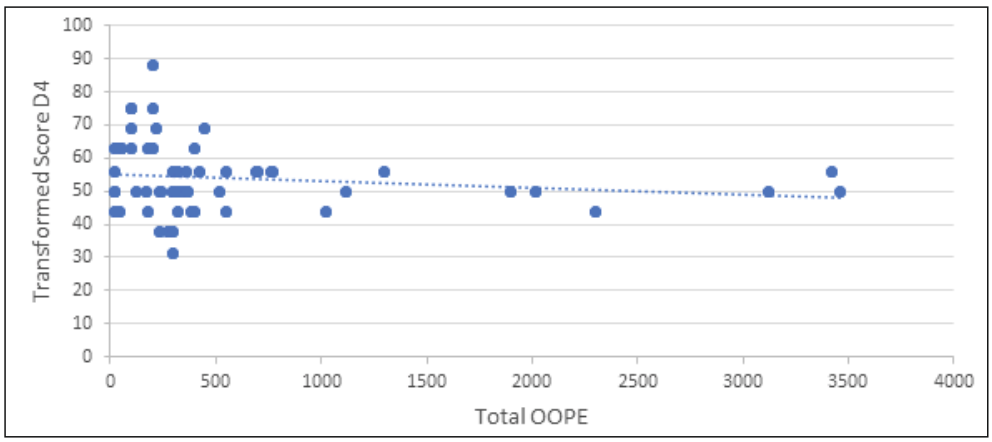


Figure 2: Correlation between Environmental health domain of QoL and total OOPE (N=232)



The highest direct health expenditure was accounted by the cost for diagnostic tests followed by cost of medicine in the present study and study by Poudel et al at Nepal.[18] This study found that OOPE from medicines and investigations in HIV care is a huge barrier to health care which is consistent with some literature.[18-21]

About 46.8% and 60% of households were affected by catastrophic health expenses respectively in the study by Barennes et al[5]at Lao People's Democratic Republic and Adeniran et al[17] at Nigeria which was much higher than current study (5.1%);study by Alvi et al in Uttar Pradesh(8.1%),[15] study by Beaulière at Côte d'Ivoire(12.3%%).[19] and study by Shukla Et al at North India(16.1%).[20]

In the present study age group 18-39 years, residing in a joint family, family member infected with HIV and associated co-morbidity had statistically significant higher odds of direct health expenditure whereas the major determinants for the direct costs were household income, occupation, health status of respondents, respondents accompanied or not, and study district in Nepal. [18]

In this study about 41.4% rated their quality of life as neither poor nor good , only 18.9% replied with a positive rating of "good", 24.1% were dissatisfied, 29.3% reported being satisfied and 46.6% mentioned that they were neither satisfied nor dissatisfied with their health. In a study by Sarkar et al at Calcutta School of Tropical Medicine (CSTM) Kolkata, the corresponding figures were 55.5%, 28.2%, 38.6%, 19.1% and 41.4%,[9] respectivey In another study by Sunita et al at Himachal Pradesh,[22] 71.25% patients rated their QOL good and only 10% were dissatisfied with their health.

The present study used the WHOQOL-BREF-HIV scale to determine the QOL of persons who were infected with HIV/AIDS and registered at the ART

centre of IPGMER-SSKMH . In this study mean scores ± SD of the patients on various domains and facets of WHO QOL BREF were physical health score 56.4 ± 15.6, psychological health was 46.2 ± 13.4, social relationship was 48.9 ± 13.8, and environmental health was 54 ± 10.5 which were almost in line with Kolkata study. [9] In our domain-based analysis, we observed there is a need for more attention toward psychological and social relationship domain as compared with other domains.

The mean scores were highest for physical domain in the current study, which was similar to study by Sarkar et al at Kolkata,[9] Shukla et al at Lucknow,[14] Sunita et al at Himachal Pradesh,[22] Dasgupta et al at Malda ,[23] Arya et al at Delhi,[24] Arjun et al at South India,[25] Giri et al at Nepal,[26] Liping et al at China,[27] and Alvi et al at Aligarh,[28] in contrast to the study by Rajeev et al at Chitradurga, Karnataka where psychological domain had highest mean score,[13] Wig et al at North India where social domain had highest mean score,[21] and Agarwal et al at Madhya Pradesh[29] where mean quality of life score was highest in the environmental domain. Majority patients in this study were stable, asymptomatic, on long-term treatment with minimal side effects. This is the reason why the physical domain was found to have a good score.

The present study found an association between QOL and age group which was reported by Liping et al[27] and Acharya et al.[30] Contrary to the study by Acharya et al where education HS and above had significant association with overall QOL currend found no association between QoL and level of education.[30]

Age, Type of family, socioeconomic status, type of occupation had significant association with the QoL in this study while educated, employed in the government sector, belonging to general caste category and living with their spouse were the factors for their better QOL in HP.[22] Age, education, employment, income and CD4 count had positive correlation with QOL in Delhi study.[24] Participants with higher socioeconomic status (SES) and self-motivated to take ART had shown better scores across all the domains of QOL in South India study.[25]

QoL scores shared a negative correlation with the total OOPE, but it was not statistically significant. Direct and indirect health expenditures were also negatively correlated with the QoL.

Conclusion:

Availing HIV care needs OOP expenditures despite free provision of HIV/AIDS care, most of which is spent on non-medical and indirect expenses. OOPE was experienced by all participants. Nearly half of the participants reported overall and domain wise poor QOL. With increase in OOPE, the QoL worsened. Efforts must be directed to increase social and emotional support perceived by PLHIVs and innovative supporting policy should be implemented so as to improve the quality of life of PLHIV. Encouraging family, friends, and employers to provide support, understanding, and non-stigmatizing treatment can help them maintain their self-esteem, relationships, and professional lives.

Acknowledgment:

We express sincere gratitude toward all the study participants who provided their valuable time for the interview and shared their personal experiences, which helped shape this study. We would also like to acknowledge the authority and all the concerned staff at the ART Centre, IPGME&R, and SSKM Hospital, Kolkata, for their cooperation and precious insights into the subject of this research work.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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A Cross-Sectional Study on Quality of Life of Patients with Coronary Artery Disease Attending Out Patient Cardiology Department of a Tertiary Care Hospital, Kolkata, India

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Abstract:

Introduction: Developing countries like India prevalence of coronary artery disease (CAD) is increasing day to day from 1.6 percent to 7.6 percent in rural areas and 1.0 percent to 13.6 percent in urban areas in last few decades and it is going to be a double burden near 2035. Indians are known to have the highest coronary artery disease (CAD) rates. **Objectives:** To find out the socio-demographic characteristics and clinical profile of the patients suffering from coronary artery disease (CAD) attending a tertiary care hospital. This study also assessed the health-related quality of life (HRQOL) of patients. **Method:** A hospital based cross sectional study was done in Patients more than 18 years of age with coronary artery disease attending Cardiology OPD SSKM Hospital in Kolkata. The study was done from the year August 2020 to September 2022. The study was done on 220 patients by using a structured pretested Mac New HRQOL questionnaire. **Results:** The median age of coronary artery disease patients was 56 (50-62) years. Around one-third portion (34.1%) of the study participants achieved a primary level of education. The Median (IQR) of per capita income (Rs/month) of the study participants was 2000 (1250-3938). Nearly three fourth (71.4%) participants had various types of co-morbidities. Clinically, 88.2% had normal heart rates, 51.4% had normal blood pressure and 43.6% had low ejection fraction. MacNew HRQOL score among participants were 4.7,4.8,4.4 in social, emotional and physical domain, respectively. **Conclusion:** Male gender, lower socio-economic conditions, low level of education, inadequate dietary diversity patterns and substance user outnumbered their counterpart. The HRQOL was found satisfactory but lacking in physical domain.

Keywords: Coronary Artery Disease (CAD), Mac-new heart disease health-related questionnaire for health-related quality of life (MACNEW-HRQOL), Quality of Life.

Introduction:

Cardiovascular disease is the most common non-communicable disease-causing death now globally. CAD has been predicted to be the cause of 30.0% of the world's death toll by the year 2030. Ischemic Heart Disease(IHD) was the leading cardio vascular death (CVD) in terms of contribution to total death worldwide (~50%).[1] Among the 18.6 million CVD deaths worldwide in 2019, 58% occurred in Asia.[2] In case of developing countries like India prevalence of CAD is increasing day to day from 1.6 percent to 7.6 percent in rural areas and 1.0 percent to 13.6 percent in urban areas in last few decades. It is going to be a double burden near 2035.[3] For Indians, particular causes of concern in CVD are early age of onset, rapid progression, and high mortality rate. Indians are known to have the highest coronary artery disease (CAD) rates.[4,5]

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Maity S, Dutta D, Paul B, Bag N , Sarkar C. A Cross-Sectional Study on Quality of Life of Patients with Coronary Artery Disease Attending Out Patient Cardiology Department of a Tertiary Care Hospital, Kolkata, India Healthline. 2024; 15 (1): 51-58
	DOI : 10.51957/Healthline_ 591_2024	

The studies are scarce regarding socio-demographic profiles and morbidity profiles lead to lack in knowledge and practice about CAD patients quality of life. There are very few studies in West Bengal and also in India regarding post-treatment Health-related quality of life (HRQOL) status.

With this background this study aimed to assess the socio-demographic characteristics and clinical profile and HRQOL of the patients suffering from coronary artery disease (CAD) attending a tertiary care hospital in Kolkata

Method:

It was a hospital-based cross-sectional study**.** Any patients more than 18 years of age with coronary artery disease attending Cardiology OPD of a tertiary care hospital in Kolkata taken as the study population. The study was done from the year August 2020 to September 2022.

Inclusion criteria: Patients more than 18 years of age having from coronary artery disease with evidence of one or more lesions, >50% severity in a native epicardial coronary artery (left main, left descending, circumflex artery, or right coronary artery) or a major side branch of a native artery diagnosed by angiography at least six months ago who underwent treatment were included in the study.[6] Patients who were unwilling to give consent for participation and who were critically ill were not included in this study.

Sample size

Sample size was calculated by the formula: $N= [Z (1-\alpha/2)]^2 SD^2/d^2$. Z =Standardised normal variate (two-tailed): at 95% CI it was 1.96. σ= Standard Deviation (to be obtained from previous studies) d = Specified precision on either side of the standard deviation. A similar study was conducted at Ataturk training and research hospital, in Izmir, Turkey, by Z.I. Akyildiz et al in 2014.[6] According to that study, the Mean and Standard Deviation of McNew's Heart Disease-related QOL score was 5 & 1.2. The specific precision value (d) is taken at 0.2 according to the study by Hofer S et al.[7] This gives a sample size of ≈139. As design effect 1.5 is multiplied. Thus, Minimum Sample size n =209.Considering 5% non-response rate the final sample size was 220.

Sampling method, Data collection, Study tools and technique

Systematic Random Sampling technique was applied, every tenth patient attending OPD was chosen till per day sample size was completed. This consideration was taken on the basis of the average attendance of patients daily at OPD, sample size of the study and the average time taken for data collection from each participant. Face-to-face interview, anthropometric measurements, clinical examination and review of medical records had been done by the researcher. Predesigned, pre-tested, structured questionnaire containing questions related to sociodemographic questions related to morbidity, behavioural characteristics, clinical profile, clinical measurements and Mac-new heart disease health-related questionnaire for health-related quality of life (HRQOL)[7] was used. The MacNew questionnaire was designed to assess patients' perceptions about how CAD affects daily functioning and it had 27 items with a global HRQOL score and physical limitation, emotional, and social function subscales. Using a 2-week time frame, the MacNew items and subscales were scored from 1 (low HRQL) to 7 (high HRQL).[7] The Mac-New HRQOL score of this study was normally distributed. All ethical principles of a research on human being was followed that was outlined by the institutional ethical committees of AIIH & PH and IPGME & R-SSKMH.

Results:

The median age of coronary artery disease patients was 56 (50-62) years; where the minimum and maximum ages were 32 and 90 years, respectively. Among the study participants, 35.9% belonged to 51-60 years of age group.

Among the study participants, majority (83.2%) were male. Around 57.7% of the study participants permanently lived in urban areas. Sixty six percent of the study participants belonged to joint family. Among the study participants 16.3% were sales workers,14.1% were professionals, 12.7% were agricultural workers. Among the retired participants the last occupation was considered here.

Around one-third portion (34.1%) of the study participants achieved a primary level of education with Median year of schooling of six years. Nearly one-third portion of the study participants (30.9%) belonged to lower class (According to modified B.G Prasad scale 2021).[8] The Median (IQR) of per capita income (Rs/month) of the study participants was 2000(1250-3938). (Table 1)

Nearly one-third (27.2%) had adequate dietary diversity in 24 hour recall method**.** Only 5% of the study participants were practicing a high level of physical activity. Three-fourths (75%) of the study participants were ever substance users. Among the study participants, nearly three fourth (71.4%) had various types of co-morbidities. Among the study participants, 88.2% had normal heart rates, 51.4% had normal blood pressure and 43.6% had low ejection fraction. (Table 2)

Table 1: Socio-demographic characteristics of the study participants (N = 220)

Socio-demographic characteristics		**n (%)**
Age (in completed years)	≤40	22 (10.0)
	41-50	42 (19.1)
	51-60	79 (35.9)
	61-70	64 (29.1)
	>70	13 (5.9)
Gender	Male	183 (83.2)
	Female	37 (16.8)
Residence	Rural	93 (42.3)
	Urban	127 (57.7)
FamilyType	Joint	145 (65.9)
	Nuclear	75 (34.1)
Marital status	Married	209 (95.0)
	Unmarried	5 (2.2)
	Widow/separated	6 (2.8)
Occupation	Skilled	88 (40.0)
	Semiskilled	103 (46.8)
	Unskilled	29 (13.2)
Educational status	Illiterate	33 (15.0)
	Non-formal education	30 (13.6)
	Primary education	75 (34.1)
	Middle school	51 (23.2)
	Secondary education	21 (9.5)
	Higher Secondary	5 (2.3)
	Graduate and above	5 (2.3)
Socioeconomic status[#]	Class I	16 (7.3)
	Class II	39 (17.7)
	Class III	49 (22.3)
	Class IV	68 (30.9)
	Class V	48 (21.8)

* Modified B. G. Prasad Classification 2022

Table 2: Clinical profile among the study participants (N=220)

Clinical profile		n (%)
Acute presenting symptoms*	Chest discomfort	61 (27.7)
	Exertional breathlessness	50 (22.7)
	Palpitation	22 (10.0)
	Sweating	16 (7.2)
	Syncope	2 (0.9)
Co-morbidity*	Hypertension	114 (51.8)
	Anemia	98 (44.5)
	Diabetes	61 (27.7)
	Dyslipidaemia	49 (22.2)
	Psychological morbidity	45 (20.4)
	Renal disease	10 (4.5)
	Respiratory illness	5 (2.2)
Resting heartRate	Normal	194 (88.2)
	Bradycardia	23 (10.4)
	Tachycardia	3 (1.4)
Left ventricular ejection fraction	Normal	124 (56.4)
	Low	96 (43.6)
BMI	Underweight	5 (2.3)
	Normal	69 (31.4)
	Overweight	80 (36.4)
	Obese	66 (30.0)
Treatment status	Angioplasty +anti schemic medications	162 (73.6)
	CABG+ anti-ischemic medications	7 (3.2)
	Only anti-ischemic drugs	51 (23.2)

*Multiple responses possible for these variables

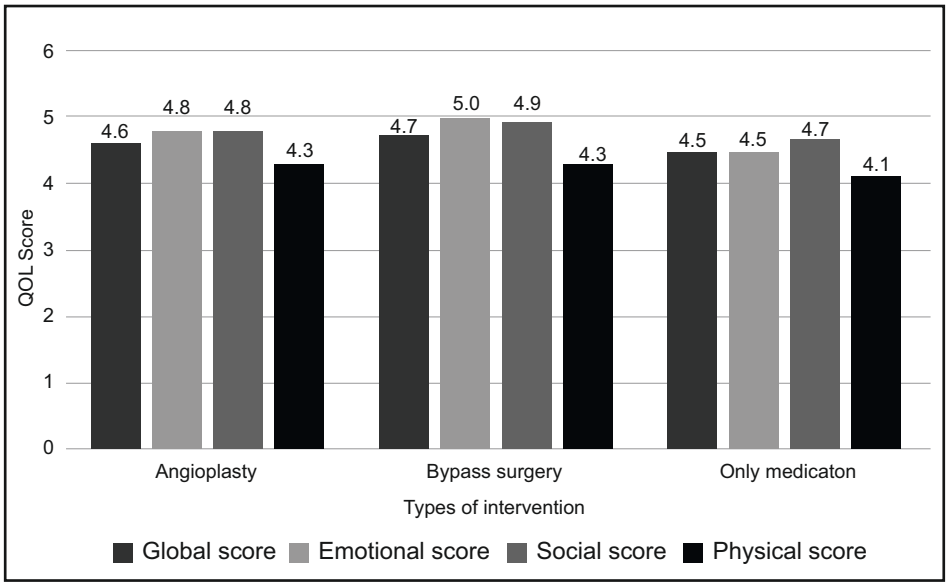
The global score of the MacNew HRQOL Scale among the study participants was 4.7. Score for social, emotional and physical domain was 4.7, 4.8, 4.4, respectively. (Table 3) Score of HRQOL life domains varies with different modes of treatment with higher emotional domain score as compared to physical domain. The participants gone through cardiac bypass grafting had higher QOL score in three domains except physical domain. Physical domains score of QOL was more or less same in all types of treatment modalities. (Figure 1) It was seen that there was a weakly negative correlation between the increasing age and QOL of the study participants. (correlation coefficient: -0.1)

Among the participants, the male had higher QOL than the female. The female gender had a lesser QOL score among the overweight and obese population.

Table 3: Assessment of the quality of life (QOL) of the study participants (N=220)

MacNew QOL score	Mean (SD)
Social score	4.7 (0.4)
Emotional score	4.8 (0.5)
Physical score	4.4 (0.4)
Global score	4.7 (0.4)

Figure 1: Distribution of QOL score in different domain according to different intervention done (N=220)



The participants who belonged to higher socioeconomic classes had higher QOL scores and those who were living in urban areas had better QOL. The participants who used to do high levels of physical activity had better QOL scores and those who never used any substances in their lifetime had better QOL.

It was seen that there was a negative correlation between the increasing age and QOL of the study participants. Male participants were seen to have better QOL than females (independent t value=3.5, p =0.005). Higher educational level among the study participants had with better QOL (f value=4.6, p=0.005). Higher SES among the study participants showed better QOL (f value=4.5, p=0.001). The participants who used to do a high level of physical activity had higher QOL scores and those who never used any substances in their lifetime had better QOL. (Table 4)

Discussion:

In the current study among the study participants around 35.9% were in the fifth decade of life with a median age of fifty-six years. About 10% of the study participants less than forty years of age had significant blockage in the coronary artery. A study was done by De Boer SP et al,[9] showed similar results where the mean age of CAD patients was found to be sixty years. The majority (83.2%) of the study participants were male. Similar results were found in the study done on CAD patients by Pravakaran D et al,[10] and Mandal S et al[11] in Delhi and West Bengal, respectively. A study done by Cook S, et al[12] in Europe found that 71% were male among CAD patients. Around 57.7% of the study participants permanently lived in urban areas and 42.3% were residing in rural areas. The study done by Bhatt P et al[13] showed that nearly 30% of unemployed women had CAD. In the study of O. Bjerkeset et al[14] showed that 75% of the CAD patients were employed. Nearly 34% of the study participants achieved the primary level of education i.e. passed class V. Fifteen percent were illiterate and nearly the same portion had non-formal education. The median years of schooling was six. Bhatt P et, al described that nearly 25% of the CAD had no formal education**.** Only 7.3% of the study participants belonged to upper class. Among the study participants, 30.9% belonged to lower class. The Median (IQR) of per capita income (Rs/month) of the study participants was 2000 (1250-3938). Sudevan R et al[15] studied CAD patients in Southern India and presented that nearly sixty and thirty percent of the CAD patients belonged to middle and lower SES respectively. Calwell M et al[16] found that nearly two third of the women with CAD belonged to middle SES.

Table 4: Distribution of study participants according to Quality of life and socio-demographic profile [N=220]

Socio-demographic profile	Category	Number	Mean (SD) (global score)	Independent t-value */ f-value	p value
Age[#] (years)	≤40	22	4.7 (0.32)	2.2	0.1
	40-60	121	4.6 (0.35)		
	≥60	77	4.5 (0.39)		
Gender	Male	183	4.6 (0.36)	3.5*	0.005
	Female	37	4.5 (0.38)		
Family type	Joint	145	4.5 (0.39)	-2.1*	0.03
	Nuclear	75	4.7 (0.30)		
Marital status	Living with spouse	209	4.6 (0.36)	-1.1*	0.25
	Not living with spouse	11	4.7 (0.37)		
Educational level[#]	Below primary	138	4.6 (0.35)	4.6	0.005
	Up to secondary	51	4.5 (0.38)		
	Above Secondary	31	4.8 (0.31)		
Socioeconomic status (SES)[#]	Class V	48	4.5 (0.32)	4.5	0.001
	Class IV	68	4.5 (0.36)		
	Class III	49	4.6 (0.41)		
	Class II	39	4.7 (0.33)		
	Class I	16	4.8 (0.28)		

[# ANOVA test was done, for other variables independent t-test (two tailed) was done]
[*t values came from independent t test (two tailed) and f values came from ANOVA test]
p values<0.05 were statistically significant

This study showed that 35% of the study participants had consumed just three types of food groups which required a minimum of six types of consumption for being healthy in twenty-four hours. A study done by Mukherjee, et al.[17] in West Bengal showed dietary diversity pattern was similar. The majority (76.4%) of the study participant's physical activity status was low in this study also. The median duration of low physical activity was 10 hours per week. Only 5% of the study participants were practicing a high level of physical activity with a median duration of 14 hours per week.

Among the study participants, nearly two third (63.6%) had acute symptoms in the last fifteen days. The symptoms were chest discomfort (27.7%), exertional breathlessness (22.7%), and palpitation (10%) predominantly.

The participants in the current study had hypertension (51.8%), anemia (44.5%), diabetes (27.7%), dyslipidaemias (22.2%), and psychological morbidities (20.4%) as major comorbidities. Mozaffarian et al[18] showed the prevalence of hypertension (63.4%), Diabetes (26.7%), and Psychological illness (30%) among the study participants. Among the study participants, 88.2% had normal heart rates, 51.4% had normal blood pressure and 43.6% had low ejection fraction. Chan et al[19] showed that the average heart rate of coronary artery disease remained between 62-81 beats per minute and the systolic blood pressure median was 132 with IQR 118-150 beats per minute.

The global score of the MacNew HRQOL Scale among the study participants was normally distributed [Sapiro Wilk test: p value:0.64 (non-significant)]. The social score was 4.7. The emotional domain score was 4.8. The physical domain score was 4.8. The global score was 4.7.

The QOL among the study participants was found to be quite good in global and emotional domains. But it was average in the social domain and slightly reduced in the physical domain among the study participants. Cohen J et al[20] studied in Europe had similar findings. It showed there was an association between physical score and treatment satisfaction and QOL. Z.I. Akyildiz et al showed that Emotional, physical, social, and global scores of QOL tended to decrease across angina or chest pain frequency.

The QOL among the study participants was higher in younger age groups and female participants had lesser QOL scores. A study done by Spertus J A et, al[21] found that males had better HRQOL [OR (CI)1.4 (0.5, 5.6)].

It was seen that there was a negative correlation between the increasing age and QOL of the study participants. The male participants were seen to have better QOL (independent t value=3.5 p=0.005). Nuclear family had better QOL (independent t value= -2.1 p=0.03) found in this study but the result was statistically significant. Cohen D J et al had shown that there was no significant difference in HRQOL across the basic sociodemographic characteristics among CAD patients. Bahramnezhad F et al[22] found low QOL in women in their study. Higher educational level among the study participants was associated with better QOL (f value=4.6 p=0.005). Higher socioeconomic status among the study participants showed better QOL (ANOVA f value=4.5 p=0.001. Prabhakaran D et alfound that individuals from lower socioeconomic backgrounds frequently did not receive optimal therapy, leading to poorer outcomes.

Limitation:

As the study was cross-sectional, temporal relationship could not be established. To establish the causal relation further longitudinal studies would be required. This study was done in a tertiary care center. The participants were selected from patients of the OPD department only. So, the result of the study could not be generalized to all population.

Conclusion and recommendation:

HRQOL global score of the study participants was 4.7, with lower mean score for physical domain as compared to other domains. Lack of physical activity, sociodemographic barrier, substance use, unbalanced diet were considerable factors for HRQOL.

This study showed that people affected by CAD had male predominance. Lower socio-economic conditions, low level of education, inadequate dietary diversity patterns and substance user had lesser HRQOL. The study participants were influenced largely by the presence of co-morbidities, uncontrolled chronic illness with longer duration, adverse cardiac profile, low left ventricular function, and acute debilitating illness.

The prevention of risk factors like low physical activity, unbalanced diet, and quitting of the substance used were the way to reduce burden of CAD and as well as the path to improve health related QOL. The participant should be aware about the risk factors and co morbidities to maintain healthy lifestyle for persuading a good quality of life.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Assessment of Physicochemical and Microbiological Qualities of Drinking Water in Ahmedabad Slum, India: A Cross-Sectional Study

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Abstract:

Introduction: The quality of drinking water is a public health concern, especially in urban slum areas. Drinking water quality and contamination are seriously threatened by the growing slum population and irregular water supply. **Objective:** To examine the physicochemical and microbiological quality of drinking water in the field practice area of one of the Tertiary-care hospital in Ahmedabad a part of PG teaching activity **Method:** A cross-sectional study was carried out for water quality assessment using stratified random sampling. A total of 139 water samples were collected; samples were collected from different households in different areas of the Asarwa ward of Ahmedabad Corporation. From each ASHA worker's area, according to population of that area, 6 to 10 samples were selected. The samples were analysed using standard methods and compared with WHO and BIS water quality standards. **Results:** TDS and alkalinity are above permissible levels in 42.4% and 46.7% samples respectively. pH, turbidity, conductivity, total hardness, and magnesium were found altered in a few samples. The mean free residual chlorine was 0.05 mg/L. Microbiological analysis of water samples revealed the presence of coliform in 5 (3.6%) samples. **Conclusion:** Except for total alkalinity and TDS, most physicochemical parameters of drinking water were acceptable. By storing water, a low level of free residual chlorine can be justified. A few samples (3.6%) with coliform bacteria indicate water contamination somewhere in the distribution system or at the consumer level.

Keywords: Drinking water quality, Microbiological parameter, Physicochemical parameter, Urban slum.

Introduction:

The quality of the water provided is critical in determining the health of individuals and communities as a whole.[1] Lack of access to clean, safe drinking water is a major contributor to global ill health, especially in developing nations.[2]

Three main elements that significantly affect the quality of drinking water in the water distribution network are the quality of raw water at the source, the purification process employed for water and the distribution system used for water.[3] These three elements affect the physicochemical characteristics as well as the microbial composition of drinking water.[4] Geochemical processes like weathering, dissolution, hydrolysis, precipitation, adsorption, and ion exchange as well as oxidation-reduction and biochemical reactions are major controlling factors for physiochemical changes in drinking water.[5]

Assessment of physicochemical parameters like pH, electrical conductivity (EC), total dissolved solids (TDS), alkalinity, and the levels of fluoride, arsenic, lead, and nitrate is generally considered to set

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Raval D, Rathod D, Panchal R, Ghevariya J, Patel K. Assessment of Physicochemical and Microbiological Qualities of Drinking Water in Ahmedabad Slum, India: A Cross-Sectional Study. 2024; 15 (1): 59-65
	DOI : 10.51957/Healthline_ 589_2024	

guidelines and categorize the physicochemical water quality. On the other hand, coliform count, E. coli in particular, determines the microbiological quality of drinking water.[6]

Drinking water pollution by industrial (Toxic elements) and agricultural (Runoff fertilizers) activities as well as its contamination (Poor sanitation and hygiene) are a major threat to human health. Reports from the Water Aid mentioned that even households that receive drinking water from "improved" sources are also above the permissible limits of WHO standards.[7]

In India, around 200,000 people died annually due to inadequate or unsafe water supplies. In era of rapid urbanisation this problem is worse in urban areas. According to census 2011 data, around 30.8% of India's rural household and 70.6% of Urban household has access to safe drinking water, slum households have better access to tap water compared to non-slum households. Despite of this quality of drinking water is still a concern in Indian cities.[8,9]

In Ahmedabad city, large-scale drinking water purification is done by the municipal corporation. Water is then distributed to households by a well-established network of pipelines followed by routine surveillance and monitoring to be conducted at various levels as per the guideline.[10,11] This study aims to examine the physicochemical and microbiological quality of drinking water in a slum of Ahmedabad city.

Objective:

To examine the physicochemical and microbiological quality of drinking water in the field practice area of one of the Tertiary-care hospital in Ahmedabad a part of PG teaching activity

Method:

This cross-sectional study was conducted at the urban field practice area (Asarwa Urban Health Centre) of the community medicine department, B.J. Medical College, Ahmedabad between September 2020 to July 2021. The approval of the institutional ethical committee and local health authority was obtained prior to the study. Sample size of 139 determined for convenience. As per the data obtained from local health authority there were approximately 15,000 households with 73,000 population in Asarwa Urban Health Centre (UHC). Households in this UHC are distributed among 16 Accredited Social Health Workers (ASHA workers) to cater for the health needs of people, approximately 1000 households for each ASHA. Stratified - proportionate sampling was conducted by considering the population of ASHA worker's areas in relation to the total population of Asarwa ward, subsequently 6 to 10 households from each ASHA worker's area were selected randomly.

After taking informed consent and explaining the purpose of the study, 3 water samples were collected from each household. From the storage containers for drinking water, 1000 ml was collected in a plastic bottle for physicochemical analysis; 200 ml and 20 ml were collected in an air-tight sterile glass container for microbiological examination; by using standard water collection techniques.[12–14] Collected samples were transported in the icebox to medical college. The physicochemical and microbiological analysis was performed on the same day using standard techniques as per available calibrated instruments mentioned in Table-1, available in postgraduate research laboratory in the community medicine department. Parameters such as colour, odour, test, temperature, turbidity, pH, conductivity, TDS, total hardness, calcium, magnesium, chloride, sulphate, total alkalinity, free residual chlorine, and chlorine demand were measured and recorded.

Qualitative bacteriological analysis was done by strip method in the postgraduate research laboratory of the community medicine department. For quantitative bacteriological analysis, samples were sent to the microbiological laboratory of the attached medical college within two hours. Multiple tube test

was performed on each sample to detect coliform organisms by the Most Probable Number (MPN) method. Water samples with coliform ≥1 cfu/100 ml were considered non-acceptable for drinking purpose.[15] Water samples which were positive by microbiological method were informed to the Medical Officer and public health supervisor of the respective areas for necessary action.

The microbiological analysis was performed by qualitative and quantitative methods. Results were compared with local guidelines issued by the Water And Sanitation Management Organization (WASMO),[16] W.H.O. water quality standards,[17] European standards[18] and BIS/ICMR guideline.[19]

Table 1: Parameter tested and analytical method[14,19]

Type of Parameters	Parameters	Methods
Physicochemical	Temperature	Thermometer
	Colour	Visual comparison
	Odour	Smelling
	Taste	Tasting
	pH	pH strip
	Turbidity	Turbidity Scale
	TDS	TDS meter
	Conductivity	Digital conductivity
	Total Hardness	Titrimetric method
	Calcium	
	Magnesium	
	Chlorine	
	Total alkalinity	
	Sulphate	Gravimetric method
	Free residual chlorine	Chloroscope
Microbiological	Microbiological	By Strip (Qualitative)
	Microbiological	By MPN (Quantitative)

Results:

Table 2 shows that out of 139 samples, 42% of samples were outside the limit of criteria set by a state authority (WASMO) with a mean TDS value of 456.18±158.53. 47% of samples reported total alkalinity outside the limit with a mean value of 200.8±64.48.

Total hardness is greater than recommended in 5% of samples, while magnesium is higher in 5% of samples. In 5% and 1% of the samples, pH and turbidity were found to be changed, respectively. The colour, odour, and taste are altered in one sample. All the samples' temperature, calcium, chloride, and sulphate levels are within normal limits.

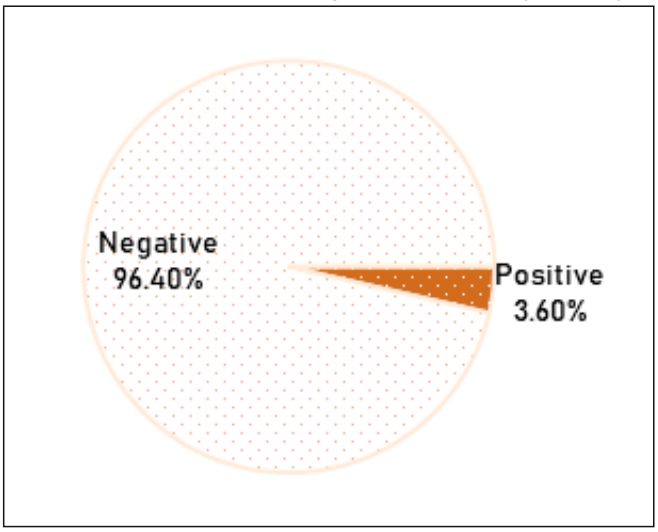
In 91% of samples, the test result of free residual chlorine was less than 0.2 mg/L with a mean value of 0.05±0.08.

Figure 1 shows that out of 139 samples, 5 (3.6%) were positive for the coliform organism. Three samples were positive by qualitative and four by quantitative method while 2 samples were positive by both methods.

Table 2 : Physicochemical analysis of drinking water in study households (N=139)

Sr No	Parameter (Unit)	Range	Mean±SD	Sample outside of the permissible limit of WASMO criteria
1	Temperature (C)	25-31	28.71±1.67	0 (0%)
2	Turbidity (NTU)	0-20.8	0.15±1.77	1 (1%)
3	pH	7-9	7.88±0.46	7 (5%)
4	Conductivity (µS/cm)	287-1540	745.37±259.51	13 (9%)
5	TDS (mg/L)	175-951	456.18±158.53	59 (42%)
6	Total hardness (mg/L)	100-228	158.3±23.44	7 (5%)
7	Calcium (mg/L)	8-48	25.42±8.27	0 (0%)
8	Magnesium (mg/L)	7-87	18.61±8.26	7 (5%)
9	Chloride (mg/L)	48-232	116.87±34.52	0 (0%)
10	Sulphate (mg/L)	17-198	73.72±32.22	0 (0%)
11	Total alkalinity (mg/L)	100-460	200.8±64.48	65 (47%)
12	Free residual chlorine (ppm)	0-0.5	0.05±0.08	126 (91%)

Figure 1 : Microbiological analysis of drinking water in study households (N=139)



Discussion:

A safe water supply is the backbone of a healthy economy, yet is woefully prioritized, globally. Water that can be delivered to a user and is safe for drinking, food preparation, personal hygiene, and washing is known as safe drinking (potable) water.[20] Changes in water quality are reflected in its physical, biological, and chemical conditions; and these, in turn, are influenced by physical and anthropogenic activities.[21]

This study assessed the physicochemical and microbiological qualities of drinking water in the slum of urban field practice area of the community medicine department. In most of the households studied, drinking water was supplied by a municipal corporation on a daily basis and stored in an earthen pot at the household level.

The appearance, taste, and odour of drinking water should be acceptable to the consumer. Aesthetically unacceptable water can lead to the use of water from sources that are aesthetically more acceptable, but potentially less safe.[17] This study found that one sample had an altered appearance, taste, and odour.

All samples in this study had a temperature in the normal range. Cool water is generally preferable to warm water, and temperature influences the acceptability of a variety of other inorganic constituents and chemical contaminants that may affect the taste. High water temperatures promote the growth of microorganisms and may exacerbate issues with taste, odour, colour, and corrosion.[17] One sample was found to be turbid. Visible turbidity reduces the acceptability of drinking water.

Table 3 : Comparison of this study's Findings in Relation to Guidelines from BIS, and the EU(N=139)

Sr No	Parameter (Unit)	Mean	SD	BIS standard (WASMO)[19]	WHO Guideline[17]	EU[18]
1	Temperature (C)	28.71	1.67	-	-	-
2	Turbidity (NTU)	0.15	1.77	1	-	-
3	pH	7.88	0.46	6.5 to 8.5	6.5 – 8.5*	6.5 to 9.5
4	Conductivity (µS/cm)	745.37	259.51	1000	-	2500
5	TDS (mg/L)	456.18	158.53	500	600*	-
6	Total hardness (mg/L)	158.3	23.44	200	500*	-
7	Calcium (mg/L)	25.42	8.27	75	-	-
8	Magnesium (mg/L)	18.61	8.26	30	-	-
9	Chloride (mg/L)	116.87	34.52	250	250*	250
10	Sulphate (mg/L)	73.72	32.22	200	250*	250
11	Total alkalinity (mg/L)	200.8	64.48	200	-	-
12	Free residual chlorine (ppm)	0.05	0.08	0.2 to 0.5		

** No health-based guideline proposed.*

The mean pH of the samples in this study was 7.88. Although pH has no direct impact on water consumers, it is one of the most important operational water quality parameters. The pH should ideally be less than 8.0 for effective chlorine disinfection.[22] The mean TDS was 456.18 mg/L. The presence of high levels of TDS in drinking water may be objectionable to consumers.[17] Total dissolved solids (TDS) are inorganic salts dissolved in water (Primarily calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulphates) and small amounts of organic matter.[23]

In this study 95% and 58% of samples were within the satisfactory limit for pH and TDS respectively. Palit A et al[24] reported more than 90% of samples did have satisfactory pH and TDS when collected at stored and at the source level.

The mean alkalinity in samples was 200.8 mg/L. Total alkalinity is a measurement of the concentration of all alkaline substances dissolved in the water that can both attract and release Hydrogen ions (H^+). It is primarily bicarbonate, carbonate, and hydroxide, along with a few others like cyanurate alkalinity. When acid is added to water, these alkalis can neutralize some of the acids and resist a reduction in pH. Although alkaline water is generally considered safe to drink, there isn't any evidence to suggest it has health benefits.[17]

Pure water is a good insulator rather than a good conductor of electric current. An increase in ion concentration increases water's electrical conductivity.[25] The mean conductivity was 745.37 µS/cm.

In this study, the level of total hardness, calcium and magnesium were 158.3 mg/L, 25.42 mg/L and 18.61 mg/L respectively. Calcium and magnesium cause hardness. The degree of hardness of water that is acceptable to the general public varies greatly from one community to another. It is significant in household usage; however, no health-based guideline value for hardness in drinking water is proposed.[17]

The mean chloride level in this study was 116.87 mg/L. Chloride in drinking water comes from natural sources, sewage and industrial effluents, urban runoff containing de-icing salt, and saline intrusion. Excessive chloride concentrations, depending on the alkalinity of the water, enhance the rates of corrosion of metals in the distribution system. This can result in higher metal concentrations in the supply. There is no health-based recommendation value of chloride in

drinking water but concentrations over 250 mg/L can cause a perceptible taste in water. (Table 3)

Sulphate in drinking water can have a detectable taste, and very high amounts can have a laxative impact on unaccustomed consumers. All samples in this study had sulphate in a normal range. (Table 3)

Chlorination is a very important process of water treatment that decreases the microbial load of drinking water and makes it safer for consumption.[26] The presence of free residual chlorine in water protects against reinfection from the point of chlorination to the point of use.[27] In this study 91% of samples didn't have adequate chlorine level. Palit A et al[24] reported that 30% of stored water didn't have adequate chlorine level. Though the mean value was 0.05 ppm, the lower level in this study could be due to the type of container, and frequency of adding/ removing water into containers. In General, by storage of water, free residual chlorine decreases.

In this study, coliform organisms were detected in 3.6% of the samples. Unsafe water can cause diarrhoeal diseases in consumers. This study didn't differentiate between contamination of drinking water at the source or at point-of-use. A study by Eschol J et al & Palit A et al revealed that dirty hands contaminate drinking water at point-of-use, adding to microbial contamination.[24,28]

A study by Palit A et al and Jensen et al reported that heavy faecal contamination can occur when the water is stored at the household level.[24,29]

This study was done as part of establishing a biophysical and microbiological testing facility for drinking water at a postgraduate research laboratory in Community Medicine Department. This initiative will be very helpful for resident doctors to learn epidemiological skills related to water. The laboratory could also be utilized to train other medical and paramedical workers. It will also supplement ongoing water quality monitoring and surveillance of diarrhoeal disease by a local health authority.

Limitations:

This was a cross-sectional study which didn't check the effect of seasons on the quality of drinking water. Our postgraduate research laboratory is in the developmental phase with limited resources hence lacking the necessary equipment to detect fluorides, nitrates, and arsenic in drinking water.

Conclusion:

Except for total alkalinity and TDS, most physicochemical parameters of drinking water are acceptable. By storing water, a low level of free residual chlorine can be justified. A few samples with coliform bacteria indicate water contamination somewhere in the distribution system or at the consumer level. The study emphasises additional protective measures like proper storage and handling at the household level.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Prevalence of Depression among Geriatric Population and its Association with Dependency: A Cross-Sectional Study in Rural Eastern Haryana, India

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Abstract:

Introduction: Depression in the elderly is becoming common and has dangerous implications on elderly that not only lowers quality of life, but it also has an impact on the prognosis of other chronic conditions leading to disability. According to WHO, depression occurs in 7% of elderly population and in India prevalence of depression among elderly is 9.3%. **Objectives:** To estimate the prevalence of depression among geriatric age group and to determine the association between the depression and the dependency among geriatric population. **Method:** Present cross sectional study was conducted with 220 villagers of age above 60 years from catchment area of Rural Health training center of medical college. The identification of depression and dependency was carried out using the Geriatric Depression Scale (GDS) and Barthel Index respectively. **Results:** The prevalence of depression and dependency among the geriatric population was found out to be 28 % and 31%, respectively. There was significant association between median scores of Barthel Index among depressed and non-depressed individuals (p value< 0.001). There was significant association between depression and dependency (P value=0.05).**Conclusion:** The present study shows 28% of prevalence of depression among elderly population and dependency as a significant risk factor for depression, thus showing the importance of analyzing dependency status while screening for the mental health status of the elderly person.

Keywords: Barthel Index, Dependency, Depression, Geriatric Depression Scale

Introduction:

People worldwide are living longer and Ageing is a natural process. At the biological level, ageing is mostly due to the build-up of numerous types of cellular and molecular damage over a period of time which results in deterioration of physical and mental abilities, disease risk increases, and eventually, death occurs.[1] Apart from these changes, ageing is linked to life transitions including retirement, decline of social support system and losing friends and companions causing loneliness and isolation. Depression is one of the major mental disorders in the world. It's known that about 280 million people per month are affected by depression episodes.[2] Depression affects one in 15 adults per year that is 6.7%.[3] Depression accounts to about 4.4% of the total DALY (Disability Adjusted Life Index) of the world and it is expected to be the second leading cause of disease burden in 2020 to 2030.[4]

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Jarole S, Tak H, Aggarwal S. Prevalence of Depression among Geriatric Population and its Association with Dependency: A Cross-Sectional Study in Rural Eastern Haryana, India. Healthline. 2024; 15 (1): 66-71
	DOI : 10.51957/Healthline_ 594_2024	

Depression in old age is an emerging public health problem which has disastrous implications which contribute to sorrow throughout, leading to morbidity. It also leads to poor physical, cognitive and social functioning. Depression not only lowers quality of life, but it also has an impact on the prognosis of other chronic conditions, exacerbating disability.[5]

In India also rapid changes in the family system have made the gearitric population more prone to psychological problems, particularly depression and community based studies have shown a prevalence range of 3.9% to 47.0% for depression.[6]

In the state of Haryana also, depression and community based studies have shown prevalence of 14.4%.[7] Functional disability is one of the major concerns among older people leading to mortality and morbidity.[8] It is described as an acquired difficulty to carry out simple daily activities or more complicated tasks required for independent living.[9] Impaired functional ability not only jeopardizes older people's autonomy but also has an impact on the family, community, health system, and older adults themselves, increasing their vulnerability and dependence as they age, lowering their quality of life, and raising their risk of developing geriatric conditions like dementia, depression, incontinence, vertigo, falls, spontaneous bone fractures, and failure to thrive.[10,11]

Along with the rapid rise in the proportion of elderly, the prevalence of diseases pertaining to older adults including depression is also expected to rise in the state. Such mental health problems often go unidentified by healthcare professionals and older people themselves. In addition, the stigma surrounding these conditions makes people reluctant to seek help. The presence of significant depressive symptoms can act as a predictor for the incidence of major depression in older adults. So, the successful identification of elderly at risk is important for early intervention due to public health implications. This research is a small step towards understanding the importance of dependency assessment during the depression screening among the elderly population.

Objectives:

To estimate the prevalence of depression among geriatric age group and to determine the association between the depression and the dependency among geriatric population

Method:

This was a cross sectional study involving geriatrics population residing at catchment area of Rural Health Training Center of Medical College. The sample size was calculated using the formula $n=4pq/L^2$. The prevalence of depression "p" among elderly was taken as 15.17%.[12] Using the above formula considering 95% confidence interval and 10 % non-response rate, sample size came out to be 220.

A house to house survey was done among all geriatric population above 60 years of age in the field area using simple random sampling. From each house only one elderly was selected randomly. Participants who have underlying other psychiatric diseases were excluded from the study. Informed consent was obtained from the study participants after explaining the nature and duration of the study.

The data was collected using two pretested questionnaires, in which one was for assessing depression in the individual and other was to identify the dependency. Depression was assessed using the 30-item GDS, which is a self-reported, basic screening measure of depression in the elderly.[13] A valid Hindi language version of GDS-30 was made available and used where ever needed. GDS Screens for seven characteristics of depression in elderly, which are somatic concern, lower affect, cognitive impairment, feelings of discrimination, impaired motivation, lack of future orientation and lack of self-esteem. According to this scale, scores between - 0–9 will be considered as normal, 10-19 is mildly depressive and 20-30 Severely depressive.[14]

Dependency was assessed using Barthel Index. The Barthel Index (BI) measures ten functions that are important for independent living – feeding, bathing, grooming, dressing, bowel and bladder continence, toileting, transfers, mobility, and stair use. Items are weighted and scored according to their perceived importance. Higher scores indicate better performance. the maximum score of 100 indicated full independence and Score of less than 60 was taken as dependent.[15]

Data analysis:

The data analysis was done using EPI INFO version 7.2.6.0. For all the test of significance P value <0.05 was considered significant. All the tests were performed at a significance level of 5%, thus an association was significant if the 'P' value was less than 0.05. Categorical variables were presented as percentages (%) and quantitative data were presented as mean (±standard deviation). Pearson's Chi-square test was used for categorical variables. Logistic regression was used to find out the independent association of various factors with depression. The outputs of regression analysis were presented as adjusted Odds Ratio (OR) with 95% Confidence Interval. Comparison of two medians of Barthel scores was tested with Wilcoxson rank sum test.

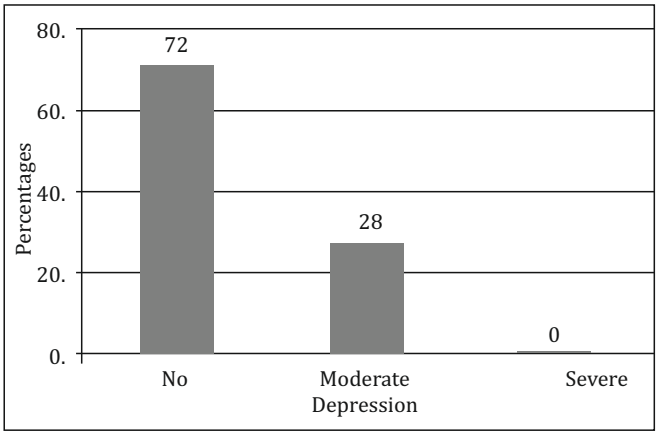
Ethical consideration:

Approval from the institutional ethics committee was taken before the beginning of study. Participants identified with depression through GDS was counseled and further referred to the psychiatrist of tertiary care if required.

Results:

A total of 220 elderly persons participated in the study. The mean age of study participants was 71 years (SD=8.4). The sample had 54.09% males and 45.91% females. In this study, the prevalence of depression among the geriatric population was 28.18% (CI: 22.34-34.62). Authors used geriatric depression scale (GDS-30) to screen depression with cut off score of 10. Mean score of GDS-30 was 6.8 (SD=4.9).Among the depressed individuals about 28% were females and 34% were males. The mean age among the participants having depression was 71 years. A GDS score of 0-9 was considered normal, 10-19 was considered mild depression and 20-30 was severe depression. Distribution of study subjects based on the severity of depression is given in Figure 1.

Figure 1: Status of Depression among Study Participants (N=220)



The dependency prevalence among the study population accounts to about 31% which was calculated using Barthel Index. The median Barthel score among the depressed and non-depressed participants were 65 and 90, respectively (p value <0.001) which means there is definite difference among the groups. Positive association was found out between depression and dependency (p value= 0.0001) (Table 2)

The variables which were significantly associated with depression in univariate analysis like age, sex and dependency were considered for multiple logistic regression analysis. The adjusted odds ratio and 95% CI are given in Table 3. Binary logistic regression revealed that after adjusting for all other factors, dependency and age were found to be independent predictors of depression in elderly.

Table 1: Status of Depression and Dependency among the Study Population (N=220)

Parameters	With depression	Without depression	P value
Mean age in years (SD)	71 (8)	70 (8)	0.05[a]
Gender			
Male n(%)	34 (28.57)	85 (71.43)	0.89[a]
Female n(%)	28 (27.72)	73 (72.28)	
Barthel score (Median, IQR)	65 (60,90)	90 (85,100)	<0.001[b]
Dependency n(%)	32 (47.06)	36 (52.94)	0.0005[a]

a- Chi square test, b- Wilcoxon Rank Sum test

Table 2: Association between risk factors among cases and controls (N=800)

Depression	Dependent (N=68)		Not dependent (N=152)		Chi square value P value
	Female n(%)	Male n(%)	Female n(%)	Male n(%)	
Present	13 (38%)	19 (55)	15 (22%)	15 (17%)	15.97
Absent	21 (62%)	15 (45%)	52 (78%)	70 (83%)	<0.001

Table 3: Multiple logistic regression analysis showing predictors of depression

Variables	Odd's ratio	95% CI	P value
Barthel's index	5.104	2.7-9.6	<0.0001
Gender	0.95	0.53-1.72	0.88
Age	1.046	1.01-1.082	0.009

Discussion:

An increasing geriatric population is associated with rising prevalence of chronic non- communicable diseases; therefore, the magnitude of depression is also expected to grow. The prevalence of depression in elderly was 28.18%. Studies have shown a prevalence as high as 76% (Chennai)[16] to as low as 8.9 % (Ludhiana)[17] for depression among the elderly. This difference may be because of differences in the study setting, sample size, scales used and, methodology. Difference in the socio-demography of the study population is also a reason for the varying prevalence.

In present study, GDS -30 with cut off of 10 was used to screen elderly population for depression. This scale was used by Pilania et al and Gupta et al but with cut off of 22 among rural and hospital settings respectively. Reported prevalence in hospital based study in North India was 28%.[18] In rural Haryana study prevalence was 14.4%.[7] This study was in same setting as present study, difference in prevalence is largely due to different cut off value used in the study.

In present study, depression was found out to be associated with age. Similar findings was observed by Barua et al in Manipal and Sengupta et al in Ludhiana.[17,19] Present study showed no significant association between depression and gender. A study

among community-dwelling elderly in Tamil Nadu found out that female gender was not significantly associated with geriatric depression.[20] But in some studies conducted in India and Sri Lanka female had higher prevalence of depression.[7,21-23]

In present study dependency prevalence was 31% and there was significant association between depression and dependency. From the study from Andhra Pradesh 24.62 percent were totally dependent on family members or others, while 24.43 percent were moderately dependent. Around 68 percent of the economically disadvantaged were depressed.[24] Economic uncertainty is one of the leading causes of psychological diseases such as depression, a multipronged strategy is urgently needed, not only in the form of government help, but also in the form of raising awareness among caregivers about supportive care.[24]

Early identification of depression is aided by screening the elderly for depression at the primary care level. This emphasizes the need for community-based therapies to effectively manage chronic illness in the elderly. As per the multivariable logistic regression model, depression was associated with older persons over the age of 80, female sex and being physically dependent. These research all point to the role of financial, physical, and psychological dependency in older adults' depression. Findings suggest that economical, physical and psychological dependencies contribute to the depression among elderly

Conclusion:

The prevalence of depression in the elderly was 28% in rural population of Eastern Haryana. Female gender and physical dependency were identified as significant risk factors of depression in the elderly. Though depression is a common mental health problem in the elderly, it is not normal part of old age. Dependency in all forms (physical, medical, social, functional and psychological) should be treated as modifiable risk factors. Elderly should never be considered a burden to society. Negligent attitude towards the elderly should be change and due considerations should be given to the geriatric population while making health policies and programs.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Profile of Deaths Due to COVID-19 in Three Zones of Ahmedabad City during the all Three Waves of Pandemic: A Record Based Study

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Abstract:

Introduction: Mortality due to COVID- 19 was observed in India including Gujarat during the pandemic. Death audit of all the deaths among cases of COVID- 19 during the pandemic was carried out in Municipal Corporation area of a city of Gujarat in India. **Objectives:** Present research was carried out to describe socio-demographic and clinical profile among deceased due to COVID-19. **Method:** Descriptive cross sectional record-based study was carried out.Case papers of 1078 deaths from three zones of municipal corporation were allotted for death audit to a tertiary care teaching hospital and the findings were described as proportions, mean, median and associations were demonstrated through appropriated tests like Chi square test, t-test. **Results:** Mean age of deceased was 63.66+11.99 years. Male:Female ratio was 2.5:1.The median duration of stay of the deceased in the hospital was 7 (IQR: 3-12). The most commonly recorded immediate cause of death was Type 1 Respiratory failure 533(49.44%).Proportion of comorbidities increased with increase in age and this was statistically highly significant. However, there was no gender-wise association of comorbidities. There was no association of SpO2 levels with age.However,SpO2 levels were significantly associated with fever, sore throat, breathlessness and ischaemic heart disease. **Conclusion:** Based on the findings of the study, individuals more than 60 years of age were identified as high risk group,Emphasis on early referral and proper management of comorbidities is required to decrease the mortality.

Keywords: Comorbidities, COVID -19, Death Audit, Immediate cause of death

Introduction:

A new human coronavirus, SARS-CoV-2, that causes pneumonia and other complications named as COVID-19 was first reported in Wuhan, China in 2019.[1] Control of the COVID-19 pandemic rely largely on non-pharmaceutical interventions.[2-8] As of 2 August 2023, there have been 768,983,095 and 44,995,665 confirmed cases of COVID-19 globally and in India, respectively with 531,917 deaths in India.[9,10]

In Gujarat, as of 6th August,2023 there were 12,91,367confirmed cases and 11,079 deaths.[11] Ahmedabad is the largest and most populous city of state of Gujarat. The population of city is approximately 8 million and this is seventh largest metropolis in India. During all the three waves of COVID-19, the city had great proportion of morbidity and mortality out of the total for the state. Since the pandemic was new hence the evidences for the

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	KapoorR, Vyas S, Patel M, Chaudhari K, Shah V, Panchal M. Profile of Deaths Due To COVID-19 in Three Zones of Ahmedabad City during the Three Waves of Pandemic: A Record Based Study. Healthline. 2024; 15 (1): 72-79
	DOI : 10.51957/Healthline_ 592_2024	

disease were nonexistent and there was a need to study all the aspects of the disease.

In view of this, the present study was carried out to know the trend, immediate cause of death and associated factors of mortality among COVID-19 cases from 62 public and private hospitals of a Municipal Corporation.

Method:

A descriptive cross-sectional record-based study was carried out, encompassing 1078 case records of COVID-19-related deaths. These records were obtained from hospitals situated in the East, North, and South zones of the Municipal Corporation. The death audit cases were referred to current institute for analysis, covering the period from June 1, 2020 to March 25, 2022.

Study area:

The city of Ahmedabad is divided in to seven zones namely Central, East, West, North, South, South West and North West for the administrative purpose. All the public and private health facilities (except civil hospital, Ahmedabad) from three zones of Ahmedabad Municipal corporation namely East, North and South were allotted to current tertiary care institute for the purpose of Death audit of all hospital deaths.

Study method:

Scanned copy of case papers from around 62hospitals where death occurred were sent to the current institute for death audit. From each public and private hospital, one nodal person was identified who used to coordinate with the death audit team of our institute. In case of need for some additional information,that nodal person would help in providing the same.The death audit team of our institute comprised of three faculties one each from departments of Medicine, Anaesthesia and Community Medicine respectively. A standard "COVID-19 Death Audit Proforma" introduced by the health department of State Government was used to audit all the deaths .The data used in this study are a part of the audit and permission to publish this data has been taken from Deputy Municipal Commissioner of the Corporation. Permission from the Institutional Review Board of the Institute was taken regarding ethical aspects of the study.

Study variables:

Authors examined data on age, gender, duration of hospital stay between date of admission and date of death of patients, symptoms of the patients at the time of admission,SpO2 level of the patients, comorbidities and cause of death.

Statistical analysis:

The data on discrete variable is presented as number and percentage. The data on continuous variable is presented as Mean, Standard Deviation (SD), Median and Inter Quartile Range (IQR). Kolmogorov-Smirnov test was used to check the normality of the continuous variable. Two continuous groups were compared by unpaired t-test/Mann-Whitney U test. Categorical groups were compared by Chi-Square test. Z test was used to check the significance difference between to proportions. The entire data is analysed using Statistical Package for Social Sciences (SPSS version 26.0, IBM Corporation, USA)

Results:

Of the 1078 deaths, two-thirds of the deceased were males 770 (71.43%). The mean age at death was 63.66$\pm$11.99 years. The results showed that there is no statistically significant difference between mean age of female and male patients (t=-0.777, P value: 0.437) (Table 1)

Of all the 1078 patients, 55 (5.1%) died within 24 hours, while 375 (34.8%) died within 1 to 5 days and 308(28.5%) died between 6 to 10 days of hospitalization. The median duration of stay of the deceased in the hospital was 7 days (IQR: 3-12). There was no statistically significant difference between males and females with respect to hospital stay.(Z=-0.127, P value: 0.899). (Table 2)

Table 1: Age and Gender wise distribution of deceased (N=1078)

Age (years)	Female n (%)	Male n (%)	Total n (%)
21-30	5 (1.62)	5 (0.65)	10 (0.93)
31-40	11 (3.57)	20 (64.52)	31 (2.88)
41-50	26 (8.44)	68 (8.83)	94 (8.72)
51-60	95 (30.84)	190 (24.67)	285 (26.44)
61-70	92 (29.87)	271 (35.19)	363 (33.67)
71-80	49 (15.90)	171 (22.20)	220 (20.41)
81-90	26 (8.44)	42 (5.45)	68 (6.31)
91-100	4 (1.30)	3 (0.39)	7 (0.65)
Mean±SD	63.21±12.85	63.84±11.64	63.66±11.99
Total	308 (28.57)	770 (71.43)	1078 (100)

Table 2: Gender wise distribution of duration of stay in the hospital among deceased (N=1078)

Days	Female n (%)	Male n (%)	Total n (%)
<1 Day	15 (4.87)	40 (5.19)	55 (5.11)
1-5	107 (34.74)	268 (34.80)	375 (34.78)
6-10	87 (28.24)	221 (28.70)	308 (28.57)
11-15	54 (17.53)	130 (16.88)	184 (17.07)
16-20	22 (7.14)	67 (8.70)	89 (8.25)
21-25	11 (3.57)	26 (3.37)	37 (3.43)
26-30	7 (2.27)	10 (1.30)	17 (1.57)
>30	5 (1.62)	5 (0.65)	10 (0.92)
Median duration (IQR)	7 (3-12)	7 (3-12)	7 (3-12)
Total	308 (28.57)	770 (71.43)	1078 (100)

Type 1 Respiratory failure was the most commonly recorded immediate cause of death 533 (49.44%), followed by acute respiratory distress syndrome (ARDS) 323 (29.96%). Other immediate causes of death were sudden cardiac death 106 (9.83%), septicaemia 73 (6.77%),multiple organ dysfunction syndrome (MODS) 24 (2.26%) and acutecoronary Syndrome (ACS) 19 (1.76%). (Figure 1)

Association of presence of various comorbidities was studied with age among COVID 19 patients. Highest proportion of comorbidities were present in people aged 60 and above. Proportion of comorbidities increased with increase in age and this was statistically highly significant. (χ^2 =36.59, p=0.0000). Total 774 (71.80%) cases had comorbidities, of which males accounted for 70.93% of comorbidities but there was no significant association between gender and comorbidities. (Table 3)

Most common comorbidities were hypertension 536 (49.72%), diabetes 457 (42.39%), ischaemic heart disease 148(13.73%), lung cancer 34(3.15%), hypothyroidism 67(6.21%). Asthma accounted for only 7(0.65%) of the comorbidities. Chronic illnesses included chronic kidney disease, chronic obstructive pulmonary disease and mental illness. (Table 4)

Figure 1: Immediate cause of death of admitted patients (N=1078)

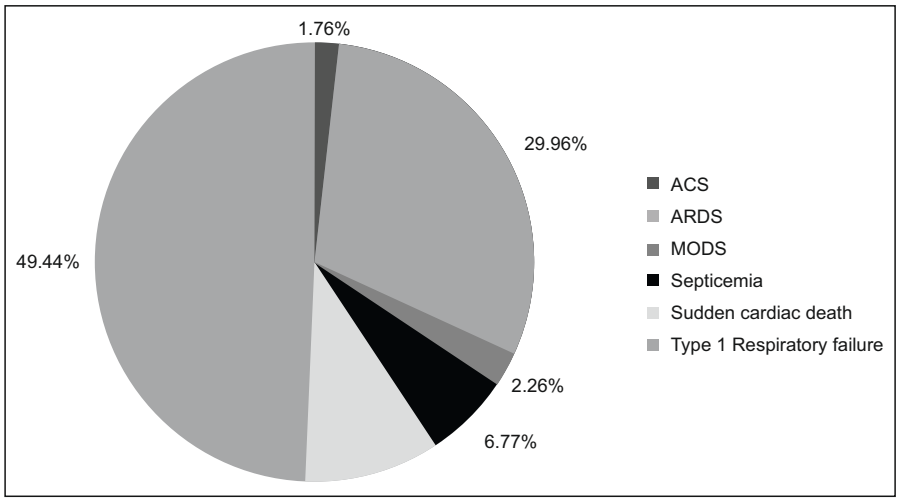

Table 3: Age and Gender wise Comorbidities among deceased (N=1078)

Variable	Comorbidities		Total n (%)	Chi-square (p value)
	Present n (%)	Absent n (%)		
Age (years)				
21-30	4 (0.52)	6 (1.97)	10 (0.93)	36.589 (<0.000)
31-40	11 (1.42)	20 (6.58)	31 (2.87)	
41-50	62 (8.01)	32 (10.52)	94 (8.72)	
51-60	193 (24.93)	92 (30.26)	285 (26.44)	
>60	504 (65.11)	154 (49.34)	658 (61.04)	
Gender				
Female	225 (29.07)	83 (27.30)	308 (28.57)	0.334 (0.563)
Male	549 (70.93)	221 (72.70)	770 (71.43)	
Total	774 (71.80)	304 (28.20)	1078 (100)	

The leading symptoms were breathlessness 792 (73.47%), followed by fever 753 (69.85%) and cough 681 (63.17%). Association of age versus SpO2 levels were studied. SpO2 levels were categorized as < 95 % and 95- 100 %. Age wise distribution of SpO2 levels showed that there was no significant difference in age wise SpO2 levels. (X^2=1.45, P value: 0.93). SpO2 levels were also studied as per presenting symptoms of patients. There was a significant association between breathlessness and SpO2 level < 95 % (Z=4.503, p value =0.000). Also, COVID 19 patients with fever and sore throat reported low SpO2 levels. (Z=2.247, p value= 0.025 & Z=2.034, p value=0.042 respectively).There was no significant association of SpO2 levels with other symptoms.As far as comorbidities are concerned Ischaemic heart disease was significantly associated with SpO2 levels <95%. (Z=-3.147, p value=0.002).Other comorbidities like hypertension, diabetes mellitus, asthma, hypothyroidism cancer, were also investigated for association with SpO2 levels; however, the results were not significant (Table 4)

Discussion:

The mean age of death in our study was 63.66 (± 11.99) years which was slightly higher than the study conducted by Baruah TD et al where mean age was 57.6±(2.4) years.[12] But was much lower than the study conducted by Bhargav et al., DU RH et al and

Table 4: Age, Association of Age, Symptoms and Comorbidities with SpO2 levels of study population (N=1078)

Variable	SpO2 (%)		Total (N=1078) n (%)	Chi-Square/ Z value	p value
	<95 (N=726)	95-100 (N=352)			
	n (%)	n (%)			
Age (years)					
21-30	7 (0.96)	3 (0.85)	10 (0.93)	1.447	0.935
31-40	22 (3.03)	9 (2.55)	31 (2.87)		
41-50	62 (8.54)	32 (9.09)	94 (8.72)		
51-60	199 (27.41)	86 (24.43)	285 26.44)		
>60	436 (60.06)	222 (63.08)	658 61.04)		
Symptoms*					
Cough	462 (63.63)	219 (62.21)	681(63.17)	0.453	0.650
Fever	523 (72.04)	230 (65.34)	753 (69.85)	2.247	0.025
Breathlessness	564 (77.68)	228 (64.77)	792 (73.47)	4.503	0.000
Sore throat	80 (11.01)	25 (7.10)	105 (9.74)	2.034	0.042
Weakness	189 26.03)	88 (25.00)	277 (25.69)	0.364	0.716
Running nose	4 (0.55)	5 (1.42)	9 (0.83)	1.471	0.141
Diarrhoea/Vomiting	15 (2.06)	11 (3.12)	26 (2.41)	-1.063	0.288
Headache/Body ache	27 (3.72)	7 (1.99)	34 (3.15)	1.524	0.127
Loss of smell & taste	1 (0.13)	1 (0.28)	2 (0.18)	-0.523	0.601
Chest pain	8 (1.10)	2 (0.56)	10 (0.92)	0.857	0.391
Comorbidities*					
Diabetes mellitus	299 41.18)	158 44.88)	457 42.39)	-1.153	0.249
Hypertension	372 51.24)	164 46.59)	536 49.72)	1.431	0.152
Ischaemic heart disease	83 (11.43)	65 (18.46)	148 13.73)	-3.147	0.002
Hypothyroidism	45 (6.19)	22 (6.25)	67 (6.21)	-0.033	0.974
Other Malignancies	13 (1.79)	7 (1.99)	20 (1.85)	-0.226	0.821
Lung Cancer	23 (3.16)	11 (3.12)	34 (3.15)	0.038	0.970
Asthma 5 (0.69)	2 (0.57)	7 (0.65)	0.231	0.817	
Any chronic illness	27 (3.72)	21 (5.96)	48 (4.48)	-1.677	0.093
CV stroke	4 (0.55)	3 (0.85)	7 (0.65)	-0.574	0.564

* Multiple Responses

Salije et al where mean age of COVID 19 mortality was 70.4 years ,70.2 years and 79 years respectively.[13-15] Torres et al also reported 75 % of COVID 19 mortality occurred in patients aged more than 75 years.[16] Findings of study conducted by deSouza et al. was almost at par with our study where majority of deaths occurred in more than 60 years of age.[17] Some studies mention that the elderly group having a higher risk of death.[18]

In present study majority (71.43%) of COVID 19 deaths were inmales.Thesefindings were in agreement with theglobal data on case fatality rates

where COVID 19 case fatality rates were more in males.Our study was also in agreement with the audit report conducted by Koya SF et al[19] and Salije H H. et al.[15] where 73 % and 60.3 % of the fatalities due to COVID 19 were in males but was in total disagreement with the study conducted byJohns Hopkins University of Medicine where data showed that in India female morality due to COVID 19 was more as compared to males.[20] Also Case fatality rates in Nepal, Vietnam, and Slovenia are also higher among women than men.[21] This was again in sharp contrast to our study. The reasons for these contrasting findings could be attributed to males being associated with increased outdoor activities due to their employment and subsequent more exposure as compared to females.

Regarding duration of stay in hospital before death, only 5.1% died occurred within 24 hours which was much less than the study conducted by Koya SF et al where 20 % of COVID 19 fatalities occurred within 24 hours while 25 % of the deaths occurred within 1 to 3 days. This was slightly less than our study where 34.8% of case fatalities occurred within 1 to 5 days.[21] The median duration of stay of the deceased in the hospital was 7 (IQR 3-12) in our study which was slightly higher than the study conducted by Baruah TD et al. where the median stay in the hospital before they succumbed was 5.5 days. (IQR 3-9).[12]

Less number of deaths within first 24 hours could be due to intense surveillance and testing activities amongst population and early referral.

In this study the leading symptom was breathlessness(73.47%) which was slightly less than the study conducted by Du RH et al.[14] where 85.7 % of the deceased had dyspnea but was higher than the study conducted by Zhang B et al where 63.4 % of deceased suffered from dyspnea.[22] 69.85 % of the patients in our study had fever which was slightly less than the study by Zhang B et al (78 %)[22] But weakness as a symptom was present in 25.69 % of deceased which was almost 50 % less than the study by Du RH[14] and slightly less than half in the study conducted by Zhang B et al[22] where 46.3 % of patients had fatigue. Cough in our study was present in 63.17 % of patients which was almost similar to study conducted by Zhang et al (64.6 %).[22] Sore throat was higher in this study (9.74%) than study conducted by Zhang et al where 4.9 % patients suffered from this symptom.[22] Headache in our study was present in (3.15 %) of patients which is again much less than the study conducted by DuRH et al where 23.4% of patients suffered from headache.[14] This discrepancy in symptoms could be explained by different demographic features.

In current study most common comorbidities were hypertension (49.72%), diabetes (42.39%) and past history of ischemic heart disease (13.73%) which were much higher as compared to Chinese studies where Hypertension, diabetes and cardiovascular diseases accounted to 6% , 7.3% and 10.5 % respectively[23] but was less than the study conducted by Koya SF et al where diabetes and hypertension were present in 66 % and 54% of the patients.[19] Ischemic heart disease (18.3%), was similar in study conducted by Koya SF et al but hypothyroidism (8.3) was higher in this study as compared to study conducted by Koya SF et al. (4%).[19] Asthma accounted for only 0.9% of the comorbidities which is drastically less as compared to study conducted by Koya SFet al where 3% of deceased had asthma.[19] The prevalence of Asthma in current study (0.9%) is smaller than the 5.5% population prevalence reported for India.[24]

This difference in data could be due to higher mean age of patients in this study.

Type 1 Respiratory failure was the most commonly recorded immediate cause of death (49.4%) in present study which was lower than study conducted by Zhang et al[22] and Kiageng Nico PN etal.[25] where respiratory failure was responsible for 69.5% and 95.06% of COVID 19 fatalities. ARDS was

recorded as immediate cause of death in 30 % of deceased which was double than study conducted by Elezkurtaj S et al (15.4%).[26] Sudden cardiac death in this study was responsible for 9.83 % of COVID 19 fatalities which was almost four times greater than study conducted by KiagengNico PN et al(2.47%).[25] Septicaemia in this study accounted for 6.8% of deaths which was almost six times greater than the study conducted by KiagengNico PN et al.(1.23 %).[25] The findings are similar to other studies which reveal that respiratory and cardio-vascular systems are the two major systems contributing to COVID 19 deaths.

The main finding of this study indicated that there existed a significant association between presence of fever and SpO2< 95 % in hospitalised patients. This was in agreement with the study conducted by Lahav et al. in children[27] and Tharakan Set al[28] in adultsbut this was in contradiction to study by Mphekgwana PM et al.[29] Also in current study there was a significant association between breathlessness and SpO2 level < 95 % which was in contrast to the study conducted by Mphekgwana PM et al.[29] where no relationship existed between breathlessness and SpO2 levels. This could be attributed to the different cohorts of hospitalised patients and groups sampled in these studies.

Conclusions and recommendations:

The mean age of death in the study was 63.66 (± 11.99) years with male predominance. The median duration of stay of the deceased in the hospital was 7 days. Most common presenting symptom was fever and breathlessness. Most common comorbidities were hypertension, diabetes and past history of ischemic heart disease.

Numbers of deaths included in this study were right from beginning of COVID 19 pandemic from the year 2020 onwards. Thereafter vaccination was also included in prevention strategy of disease. However the impact of vaccination could not be assessed but definitely this can reduce the mortality. Early identification of home isolated cases based on these three symptoms (fever, dyspnoea & sore throat) and low SpO2 levels can also lead to early referrals and subsequent decrease in mortality. Proper management of comorbid conditions like hypertension, diabetes, old cases of ischaemic heart disease etc. can reduce mortality amongst COVID 19 cases.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Assessment of Self-Care Practices among Type 2 Diabetes Mellitus Patients attending Health Care Centres of Urban Area of Hyderabad, India

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Abstract:

Introduction: As per the International Diabetic Federation Atlas, 2021, 3 in 4 adults with type 2 diabetes mellitus live in low and middle income countries. This represents a tremendous burden on the healthcare system of these countries. Self-care practices can mitigate the disease burden. **Objective:** To assess the self-care practices among the type 2 diabetic patients using Summary of Diabetes Self-Care Activities (SDSCA). **Method:** A facility based cross sectional study was undertaken among adults aged 25-60 years using a modified SDSCA, validated in Indian settings to study the self-care practices in diabetic patients. The modified domains included practices on dietary modifications, regular physical activity, foot care, regular blood glucose monitoring, drug adherence and addictions. Mean scores of these domains in SDSCA were compared with HbA1c measurements. Statistical tests performed included unpaired t-test and chi-square. **Results:** Mean age of the patients was 49.60+ 11.13 Years. There were about 117 (54.4%) patients with controlled HbA1c measurements. There was a statistically significant association of dietary modifications, regular physical activity, foot care, drug adherence and addictions with controlled HbA1c measurements. (p value=0.05). **Conclusion:** Self-care practices can significantly alter diabetes control and prevent complications. Regular glucose monitoring was lacking in several patients and led to poor glycemic controls. These results can inform clinical practice and patient care for better management of the type 2 diabetes mellitus.

Keywords: Summary of Diabetes Self-Care Activities (SDSCA), Self-care practices, Type 2 Diabetes Mellitus

Introduction:

Type 2 Diabetes mellitus is a lifestyle disorder resulting due to insulin resistance and this is precipitated by improper lifestyle practices like intake of high carbohydrates rich diet, reduced intake of fruits and vegetables, lack of adequate exercise and physical activity.[1] In the current Indian scenario, an estimated 8.7% diabetic population is present between the age group of 20 and 70 years.[2] Diabetes is related to many life threatening complications such as coronary heart disease, stroke, diabetic foot and chronic renal failure.[3] Based on reports, the average monthly expenditure per person for all of India is $1,098.25, or $13,179 per person per year.[4]

Simple carbohydrate variants are the staple food of Indians which are consumed in higher proportion. Urbanization and globalization are causing a nutrition and lifestyle transition, thereby increasing the prevalence rate of Diabetes Mellitus in the country. Other risk factors such as alcohol, smoking, and obesity also contribute to the increased prevalence.[5] It is a chronic disease that impacts at physical and physiological level. Hence, diabetes requires a multi modular approach for management

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Bala S, Babu S, Raj A, Varghese A, Aiswarya S R, Nair A. Assessment of Self-Care Practices among Type 2 Diabetes Mellitus Patients attending Health Care Centres of Urban Area of Hyderabad, India. Healthline. 2024; 15 (1): 80-85
	DOI : 10.51957/Healthline_ 582_2024	

which includes lifestyle modification, self-care, medication and follow-up. These self-care practices play an important role in the control of the disease and also reduces the incidence of complications.

Various studies have reported that by adherence to self-care practices, diabetes associated complications can be reduced.[6,7] Self-care practices are the habits taken up by the individual and the family members (who are or at risk of developing diabetes) in order to manage the disease on their own.[8] The effectiveness of diabetic control depends mainly upon the selfcare followed by the individual and support from the family members. These self-care practices include diet modification, regular physical activity, foot care, compliance to medications and periodic blood sugar levels check-up. These factors were found to have an association with good glycemic control. It is also necessary for the patient to have proper knowledge to carry out these self-care practices in a systematic manner to improve the blood sugar level. The current study aims to assess self-care practices measured by a modified Summary of Diabetes Self-Care Activities (SDSCA) and the association of these practices with Hb1AC measurements.

Method:

A facility based cross sectional study was conducted in the two urban health centers attached to a medical college in Hyderabad in the month of January 2023 to March 2023. The centers were selected based on convenience sampling considering cost and accessibility reasons.

The population selected was adults aged between 16-80 years and diagnosed with type 2 diabetes mellitus for more than 1 year. Systematic random sampling was employed and every third patient attending the OPD and meeting the study criteria was included for the study. Those with type 1 diabetes mellitus, women with gestational diabetes, lactating women, chronically ill and bed ridden patients were excluded from the study.

Sample size was calculated considering the formulae $4pq/l^2$; prevalence of self-care practices as 78% and 6% as absolute precision. The sample size was estimated to be 191 and rounded off to 215 with addition of 10% non-response rate.[9]

Institutional ethical committee clearance and informed written consent was obtained from patients before the study was undertaken. Subjects were interviewed with the use of a pretested and semi- structured questionnaire consisting of socio-demographic variables, and duration of diabetes. Following the OPD visit, a trained medical intern verbally administered the questionnaire and recorded the responses. This was later transcribed electronically. A modified SDSCA questionnaire, validated in Indian settings was used.[10, 11] The instrument was translated into the local Telugu language. The Telugu version was back translated and tested in a small group to ensure validity. This questionnaire checks the frequency with which diabetics have followed the prescribed self-care practices in the last 7 days. In total, five domains were studied which included the dietary domain covering a total of five items, namely, frequency of avoiding sweets, frequency of consuming fat-rich foods, having snacks during the mid-lunch and evening periods, restricting the quantity of cereals consumed, and consumption of fruits and vegetables. Similarly, foot care covered five items: Soaking of feet, inspecting sandals/shoes every day, washing of feet, drying of feet in between the toes and inspection of feet every day. The physical activity domain covered two items of work related and leisure-time physical activity. Adherence to medication measures covered one item (consumption of prescribed oral hypoglycemic agents). The glucose monitoring domain covered two items, how frequently the patient monitored blood glucose and how often the care taker recommended glucose monitoring. Self-care practices under each item were scored between 0 (none of the days in a week) to 7 (all 7 days were followed).

Domains were scored as per the prescribed scoring for the modified SDSCA by Selvaraj et al. [12] All items were positively scored except consumption of fat-rich items in the dietary domain and soaking of feet in the foot care domain. Reverse scoring was done for the two items mentioned above. In the dietary domain, appropriate self-care was ascertained if the patient had followed the self-care measures more than 75% of the time in a week. A cumulative score was calculated from all five items

and was converted to percentage. Similarly, for foot care the same definitions were followed, however the cut off was reduced to 20% based on the local context. The exercise domain was defined as satisfactory if the patient had followed at least 6 days of leisure-time or work-related physical activity. Adherence was measured as following prescribed medications on at least 6 days of the week. Glucose monitoring was considered satisfactory if the patient followed the recommendations given by their care provider.

Each participant's glycemic status in the last 3 months was also reviewed by measuring HbA1C using standardized method and quality assured laboratory attached to the centers. A value of HbA1c lesser than 7% was considered as a controlled measurement for glycemic status.[12]

Data entry was done and analyzed using Microsoft excel 2019. Descriptive statistics such as mean [standard deviation(SD)] and percentages were used for continuous and categorical variables, respectively. Domains of the SDSCA were compared using unpaired t test and chi-square test with the HbA1c measurements as a categorical variable. A p value less than 0.05 was considered as statistically significant.

Results:

The current study included 215 participants with the mean age of 49.60 ± 11.13 years. Among the study population, males were 112 (52.09%) and females were 103(47.9%). Most of them were Hindus (78.6%), followed by Muslims (13.48%) and Christians (7.9%). Mean duration of type 2 diabetes in the study population was 7.41± 6.81 yrs. (Table 1)

Table 1: Socio-demographic variables of study participants (N = 215)

Socio-demographic Variables	n(%)
Age (Years)	
< 30	11 (5.12%)
30-40	37 (17.21%)
40-50	61 (28.37%)
50-60	67 (31.16%)
> 60	39 (18.14%)
Gender	
Male	112 (52.09%)
Female	103 (47.9%)
Religion	
Hindu	169 (78.6%)
Muslim	29 (13.48%)
Christian	17 (7.9%)
Mean duration of diabetes	**7.41± 6.81yrs**

Table 2: Assessment of mean scores on SDSCA domains and their association with HbA1c measurements (N = 215)

Domains of SDSCA	Controlled HbA1c(<7) (N = 117)	Uncontrolled HbA1c (≥7) (N = 98)	t value	p value
Diet	22.9 ± 6.2	16.6 ± 7.68	37.695	0.0001
Physical activity	9.85 ± 3.93	8 ± 4.33	29.24	0.0001
Glucose monitoring	4.35 ± 3.3	4.52 ± 3.12	17.508	0.0001
Foot care	28.2 ± 11.2	23.1 ± 12.1	31.22	0.0001
Drug adherence	6.71 ± 0.965	6.37 ± 1.34	69.63	0.0001

Out of 215 study population, 117(54.4%) were having controlled Hb1Ac values(<7) and 98(45.5%) were having uncontrolled Hb1Ac values(≥7).

Among the various domains of self -care practices using SDSCA, on unpaired t test, the dietary practices, physical activity, foot care measures, glucose monitoring and drug adherence were found to be statistically significant with the controlled glycemic status of HbA1c <7.(Table 2)

Smoking was significantly associated with poor HbA1C control. (Table 3) The five domains of SDSCA, diet, physical activity, glucose monitoring, foot care and drug adherence were classified into satisfactory and unsatisfactory based on the cut offs defined in the methodology. Cross tabulation across the domains and control of HbA1C is depicted in Table 4. On the diet domain, 47% of the people with unsatisfactory diet had uncontrolled HbA1C. On the physical activity domain, 29% of the people with unsatisfactory physical activity had uncontrolled HbA1C while 17% of the people with satisfactory physical activity had uncontrolled HbA1C. Similarly, in foot care and glucose monitoring domains, the association between good foot care and good glucose monitoring was significant for achieving good HbA1C control. P values were significant for the four domains of diet, physical activity, glucose monitoring and foot care. P value was not significant for drug adherence as over 88% of the people were already having good adherence to medication.

Table 3: Association between smoking and HbA1c control (N = 215)

Smoking	Controlled Hb1Ac(<7)	Uncontrolled Hb1Ac(≥7)	Chi-square	p value
Yes	9 (4.19%)	108 (50.23%)	19.942	0.0001
No	32 (14.88%)	66 (30.7%)		

Table 4: Association between domains of SDSCA and HbA1c Control (N = 215)

Domains of SDSCA	Controlled HbA1c(<7) n (%)	Uncontrolled HbA1c (≥7) n (%)	Chi square value	p value
Diet				
Not satisfactory	79 (36.74%)	92 (42.79%)	22.75	< 0.001
Satisfactory	38 (17.67%)	6 (2.79%)		
Physical activity				
Not satisfactory	56 (26.05%)	62 (28.84%)	5.1	0.023
Satisfactory	61 (28.37%)	36 (16.74%)		
Glucose monitoring				
Not satisfactory	95 (44.19%)	64 (29.77%)	6.991	0.008
Satisfactory	22 (10.23%)	34 (15.81%)		
Foot care				
Not satisfactory	34 (15.81%)	42 (19.53%)	4.44	0.035
Satisfactory	83 (38.60%)	56 (26.05%)		
Drug adherence				
Not satisfactory	11 (5.12%)	15 (6.98%)	1.74	0.19
Satisfactory	106 (49.30%)	83 (38.60%)		

Discussion:

This cross-sectional study was conducted in two urban health centers of Hyderabad focusing on self-care practices among type 2 diabetes mellitus patients. In the current study, mean age of population was 49.60 ± 11.13 years, males were 52% and females (48%). Most of them belonged to lower middle class and mean duration of diabetes was 7.41±6.81years. About 24.8% had coexisting hypertension and 32.4% had other co-morbidities. Controlled HbA1c measurements were found among 54.4% of the patients.

Higher means domain scores in the modified SDSCA were obtained on the domains of dietary modifications, physical activity, foot care practices, glucose monitoring and drug adherence in patients with controlled HbA1c measurements. The association was statistically significant. Smoking was statistically significant among those having uncontrolled HbA1c measurements.

In consistency with current study findings, Molalign Takele in their multi centric study from regional states of Ethiopia found the mean age of patients as 46±14.6 years and mean duration of diabetes was 6±4.36 years. About 46.7% of the participants had followed the self-care practices. The highest SDSCA domain score was in foot care practices in concordance to the current study. Similarly, the lowest domain score was in regular blood sugar checking.[13] This may be due to non-availability of the personal glucose monitoring machines and also regular access for checking the parameters.

A study conducted in Puducherry by kalaiselvi Selvaraj et al noted the mean (SD) age of patients was 57 (11.1)years, males (17.9%) and females (82.1%). According to the modified Kuppuswamy scale, majority of them (66%) belonged to the lower middle class. Only one third of the patients followed self-care practices satisfactorily in the diet and exercise domains. The lowest domain score was in foot care practices.[12] This foot care practices score was similar to the current study which could be explained by the existing knowledge and awareness of the patients on foot care.

Another study conducted by Karthik RC in the rural area of Kancheepuram found their patients (78.8%) belonged to more than 50 years age group. More than half of them, (62%) had been diagnosed with the disease of duration greater than 5 years. The authors have categorized the SDSCA domain scores as satisfactory and unsatisfactory. The highest satisfactory score was found with regular blood sugar checkups, followed by medication adherence, dietary modifications, practicing physical exercise and the least with foot care practices.[14]

Wajid Syed in their study among outpatients of Warangal city in Telangana found statistically significant SDSCA domain scores related to physical activity and adherence to medication with controlled HbA1c measurements (Hb1Ac of value ≤7.5).[15] This variation can be explained by the discrepancies in the cut off values for the HbA1c measurements being established by different authors in their studies.

The limitations of the study is that it cannot be generalized for all types of diabetes as self- care practices as type1 DM and gestational diabetes patients were not included in this study. The cross sectional study design also hinders us from depicting the causal association and generalization of the results which are the limitations.

Conclusion:

Self-care practices can significantly alter diabetes control and prevent complications. Regular glucose monitoring was lacking in several patients and led to poor glycemic controls. These results can inform clinical practice and patient care for better management of the type 2 diabetes mellitus.

Recommendations:

Health education about self-care practices is helping patients achieve their glycemic goals. Provision of regular blood glucose monitoring with maintenance of log book about the measurements needs to be implemented by taking all the patients and their families into confidence.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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Effect of Sleep-Wake Cycles on Academic Performances and Behavioural Changes among Undergraduate Medical Students

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Abstract:

Introduction: Sleep wake cycles form major part in the life of every student, starting from the school ages itself. This cycle has a major relationship in ensuring the proper functioning and day to day activities of the individual in all walks of life. **Objectives:** To assess the quality of sleep wake cycle among undergraduate medical students and to find out the association of sleep wake cycle with academic performances and behavioural changes among undergraduate medical students **Results:** In a cross sectional study among 300 participants, 35.3 % of the participants had good sleep-wake cycle. There was a positive association between sleep-wake cycles and academic performances.($\chi 2$ value 5.24 with p value <0.05). Age, gender, residence, socioeconomic status and year of study showed statistically significant association with behavioural patterns (p value <0.05) **Conclusion:** Good qualityof sleep wake cycle was present among one third of participants. There was a positive association between sleep-wake cycles and academic performance, but no significant association between behavioral patterns and sleep-wake cycles.

Keywords: Academic Performances, Behavioural Changes, Sleep Wake Cycles,Undergraduates

Introduction:

For medical students, it is important to know the "if's and 'buts" involved in health care. For this, one of the key factors is sound sleep that revitalizes the memory.[1] This helps medical students to perform academically better. During the transition phase of higher secondary to undergraduate programme, the students are stressed with academic pressure.[2]

Research studies suggest that a number of factors, such as social and academic demands, affect the pattern of the sleep-wake cycle of healthy medical students.[1,3-5] Other factors, including study schedules, influence sleep length and regularity of sleep wake cycle. With inadequate sleep, the psychosocial well-being of students is affected leaving them confused and stressed.[6]

The relationship between the sleep/wake habits and the academic performance and behaviour of medical students in the Southern states of India is insufficiently addressed in the literature. Hence this research work has been planned with the aim to examine the effects of sleep-wake cycles on academic performances and behavioural changes among medical students of a tertiary care centre in Tamil Nadu, South India.

Understanding the magnitude of the problem and the factors related to it, preventive measures can be taken enabling the medical students become competent medical graduates.

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org	Mallika M, Nair A. Effect of Sleep-Wake Cycles on Academic Performances and Behavioural Changes among Undergraduate Medical Students. Healthline. 2024; 15 (1): 86-90
	DOI : 10.51957/Healthline_ 577_2023	

Objectives:

To assess the quality of sleep wake cycle among undergraduate medical students andto find out the association of sleep wake cycle with academic performances and behavioural changes among undergraduate medical students

Method:

A Cross sectional study was conducted at Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District, Tamil Nadu, South India during two months from 1st May 2021 to 31st July 2021 among the medical students from the first medical year through to the final year belonging to the batches 2016, 2017, 2018 and 2019, through random sampling. The sleep quality, academic performances and behavioural changes were assessed through a self-descriptive questionnaire. The students absent on the day of data collection or not willing to give consent and those on psychiatric drug treatments were excluded.

Sample Size calculation:

Using the formula $Z(1-\alpha)^2pq/l^2$where,

p= prevalence[7] of average performance taken as 72%

q =100-P =28

d =7% of p

Sample size=305

Study Tool: Semi-structured Questionnaire in English containing 2 sections.[8]

Section A: Socio-demographic details of the participants.

Section B: Details on sleep -wake cycle using Modified Pittsburgh Sleep Quality Index (PSQI) questionnaire[8] and behavioural patterns were assessed by a self-scoring questionnaire.[3]

Data collection:

Data were collected after obtaining approval from the Institutional Human Ethics Committee (Ethics Certificate Number: SMIMS/IHEC No: 1/Protocol no: 29/2021) and Informed consent from the participants. They were instructed to fill in the questionnaire keeping in mind the pre COVID period of time as they had no regular classes during the period of Covid 19.

Sleep quality[8] was considered poor for participants who obtain a score less than the mean. The behaviour patterns were assessed through a self-marking scoring system by the participants. Components like irritability, depressed, nervousness, happy, motivated, efficient, difficulty in concentration, attentive, active, alert were considered during assessment. A score above the mean was considered to be good behavioural pattern after analysis of the results.The score of behavioural patterns[6] above the mean and below the mean were categorized into good and poor respectively.

The marks obtained for an examination conducted during the period of data collection was used to analyse the students' academic performance, an overall score of more than 60 was considered as Good performance.

Data analysis:

Data were entered in Microsoft Office Excel 2019 and analysed using statistical software, SPSS .25.0. All quantitative variables were analysed for mean and standard deviation. All qualitative variables were analysed for proportions. Chi-Square test was used as test of significance, to find the association between the variables. A p value less than 0.05 or a confidence interval of 95% was considered statistically significant.

Results:

The present study aimed at identifying the relationship between sleep- wake cycles and academic performances as well as behavioural pattern among 305 medical students. Five of the participants withdrew from the study.

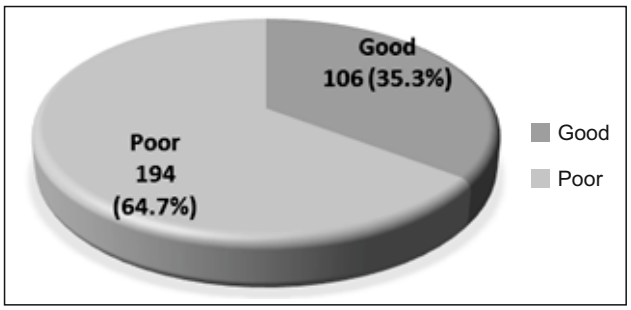
Majority (71.3%) of the participants were of age 20-22 years with 200 (66.7%) females. Mean age 21.15±1.33 years and 202 (67.3%) belonged to

Hindu religion. Majority (76%) were second and third year MBBS students, (74%) from Urban area and (56.7%) belonged to Upper Socio economic status.

SLEEP -WAKE CYCLE

The score above the mean and below the mean were categorized into good and poor sleep-wake cycle status respectively.[8]

Figure 1: Quality of Sleep-wake cycle among study participants (N=300)



Only 35.3 % of the participants had good sleep-wake cycle. (Figure1) Total 194 (64.7%) participants showed poor sleep-wake cycle, 34% needed 7 hours of sleep to feel fresh, 90.7% believed their sleep habits changed after MBBS admission, 63.7% slept for 5-7 hours on working days, 26.7% woke up by 6 AM, 79% slept late on weekends and 86.7% woke up late and 38.7% had trouble falling asleep .

ACADEMIC PERFORMANCE

Overall marks ≥ 60 and below 60 in an examination conducted, were categorized into good and poor performance respectively. Results showed that 45.7% spent 5-10 hours on academics, 62% attended all classes, 43.7% felt tired during lectures, 91.3% rated academic performance good after good sleep, 81% stayed awake late to complete records or study, 87.7% were easily distracted by electronic devices. 34.7% believed sleep wake cycles negatively influenced academic performance. There was an association between sleep-wake cycles and academic performances. ($\chi 2$ value 5.24; p value <0.05) (Table 1)

BEHAVIOURAL PATTERNS

The score of behavioural patterns above the mean and below the mean were categorized into good and poor respectively[6]; 165 (55%) showed good behavioural pattern After a normal sound sleep, 34.7% felt energetic, 53.3% tired, and 32.3% alert, 44.3% reported no difficulty in concentration.

Age, gender, residence, socioeconomic status and year of study showed statistically significant association with behavioural patterns (p value <0.05), while religion showed no association to the behavioural patterns (p value > 0.05). There was no positive association between sleep-wake cycles and behavioural patterns.($\chi 2$ value 3.14 ; p value >0.05) (Tale 2)

Table 1: Association between sleep wake cycles and academic performances (N=300)

Academic performance	Sleep wake cycle		Total	χ^2 value	p value
	Good	Poor		5.24	0.022
Good	48 (43.63%)	62 (56.36%)	110		
Poor	58 (30.52%)	132 (69.47%)	190		
Total	106	194	300		

Table 2: Association between sleep wake cycles and behavioural patterns (N=300)

Behavioural pattern	Sleep wake cycle		Total	χ^2 value	p value
	Good	Poor		3.14	0.072
Good	51 (30.9%)	114 (69.09%)	165		
Poor	55 (40.74%)	80 (59.25%)	135		
Total	106	194	300		

Discussion:

The present study examined the effect of sleep-wake cycles on academic performances and behavioural changes, among the undergraduate medical students. Other parameters studied were Age, Academic Habits, Attention in class, Mood variations, Behavioural changes. The Sleep aspects considered were Quantity, Quality, Regularity and with Schedule Changes.

The mean age of the study participants was 21.15±1.33 years, which is comparable with the previous studies done in Saudi Arabia, United States and Brazil, among undergraduate medical and high school students.[1,2,4,7] The current study clearly demonstrated a statistically significant association between sleep-wake cycles and academic performances among the medical students. The influence of various parameters and certain sleep habit patterns including the late bed time during examinations was seen to be associated with poor academic performances. Experimental studies done in the United States and Colombia, among undergraduate and high school students, previously have shown that sleep and changes in academic performance and behavioural changes are all inter-related.[5,9,10]

The changes in schedules and years of the study associated with the need in achievement of marks have shown an association with the changes in sleep pattern. Similar findings were shown by A. A Gomes et al.[3] The present study showed that age or gender or other demographic variables do not account for the erratic sleep wake pattern, which stands relevant with the previous studies conducted in Saudi Arabia.[2,7]

There was no significant association between the sleep-wake cycles and behavioural changes among the medical students. The previous study conducted among Italian high school students, showed that there is an effect of the sleep-wake cycle on the behavioural pattern that in turn affects the academic performances.[11]Another study reported a significant variation in mood with circadian phase, such that the pattern and position of sleep counts as an influencing factor for the control of mood.[12]

The present study further showed that, there is an influence of change in behavioural pattern by other parameters such as the age, gender, and year of study, which are similar to the findings by Flavia Giannoti et al.[11] The self-reporting of the sleep wake habits relies on the students' subjective accounts which was validated by Wolfson et al.[4]

Limitation of study:

The reliability of responses in view of the COVID pandemic has been identified as one of the limitations of the study.

Conclusion and recommendations:

The present study investigated the relationship between sleep-wake cycles and academic performance among undergraduate medical students. Results show a positive association between sleep-wake cycles and academic performance, but no significant association between behavioral patterns and sleep-wake cycles. The subjective feeling of better sleep pattern has a positive influence and is an independent predictor of excellent academic performance. There is a strong need for presence of peer groups and Mentors, who need to take an active role to educate about the needs of a better sleep pattern and sleep hygiene to bring the best in every medical student.

Declaration:

Funding: Nil

Conflict of Interest: Nil

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