Nutritional Status and its Associated Factors Among Under-Five Children Attending the Well Baby Clinic of a Tertiary Care Institute of Kolkata, India

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Abstract:

Introduction: A Well-Baby Clinic (WBC) is a primary healthcare facility, where children are monitored for growth and development, receive routine immunization and their caregivers are given appropriate nutritional counselling. Objective: To assess the nutritional status (Underweight and anaemia) of under-5 children attending WBC of a Tertiary Care Institute of Kolkata and to identify any associated sociodemographic characteristics. Method: A cross-sectional study was conducted for a period of 3 months (May 2023 to July 2023) among 106 under-5 children, attending WBC of a Tertiary care Institute of Kolkata, selected using consecutive sampling. Face-to-face interviews were conducted among caregivers of children using an interview schedule, and anthropometric measurements and haemoglobin levels of the children were obtained using appropriate tools. Nutritional status was defined as Normal, Underweight, and Severely Underweight based on weight for age. Anaemia levels were categorized as mild, moderate, and severe based on haemoglobin levels. Association of sociodemographic characteristics with nutritional status was assessed using Binary Logistic Regression. Results: Among the children, 72.6% belonged within 12-24 months. Almost 19% and 17% of children were Moderately Underweight and Severely Underweight, respectively. Nearly 75% had a history of exclusive breastfeeding till 6 completed months of life, while 34% received formula feed. Regression analyses revealed statistically significant associations between the nutritional status of children with their gender and mothers' education. Conclusion: Nearly 36% of the under-5 children who attended the Well-Baby Clinic of a Tertiary Care Institute in Kolkata were categorised as Moderately or Severely Underweight, indicating that a sizable fraction of these infants had nutritional issues. Furthermore, the nutritional health of these children was found to be statistically significantly correlated with maternal education and gender, highlighting the significance of addressing sociodemographic inequities.

Keywords: Nutritional status, Underweight, Under-5 children, Well Baby Clinic

Introduction:

Nutritional disorders among children under five years of age are a significant public health problem. The first is undernutrition, which includes being underweight (low weight for age), stunting (being short for age), wasting (being underweight for height), and nutritional deficiencies or inadequacies such as lack of essential vitamins and minerals.^[1] In India, according to the National Family Health Survey 5 (NFHS-5), in 2019-2020, 32.1% of children under five years of age were found to be underweight, 19.3% were wasted, and 35.5% were stunted. Not only underweight, but anaemia among under-5 children also a major public health problem globally.^[1,2] It is a significant nutritional problem affecting millions of women and children in developing countries and is characterized by a reduction in the

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haemoglobin concentration in blood, decreased quantity of red blood cells, and subsequent impairment in meeting the oxygen demands of tissues.^[2,3] Anaemia affects the cognitive development, school performance, physical activity, motor and behavioural growth, and immune functions against diseases in young children. Nutritional anaemia is the major cause particularly for young children as they require high iron quantity to maintain their growth and development. Despite the implementation of anaemia control programs including iron-folic acid supplementation, annual mass deworming, and insecticide-treated bed nets distribution, South Asian countries like India account for the largest burden of anaemia cases, and progress to decline is almost stalled. The studies done by Goyal M et al.^[4] and Ahmad S et al.^[5], focussed primarily on the undernutrition status of the under-5 children, overlooking the anaemia status among them. Considering the slow progress in the reduction of anaemia prevalence, these conditions pose a significant challenge to policymakers tasked with achieving the WHO global nutrition targets 2025 and nutrition targets of the Sustainable Development Goals (SDG), 2030.^[6]

Child growth and development are highly influenced by the living standards, socio-economic and demographic factors, cultural and climatic factors that can vary across the nations. Many studies have shown that more childhood deaths occurred in low and middleincome countries.^[7] In India, the prevalence of underweight status and anaemia, respectively, has declined in the last decade, but continues to remain high in many regions. Children of today are citizens of tomorrow, so children's nutritional status plays an important role in determining the future of any country and hence their assessment should be prioritized.

A Well Baby Clinic (WBC) is a primary healthcare facility that emphasizes on providing primary care free of cost, where caregivers come with their children to know about their growth and development as well as to get proper nutritional and family planning counselling.^[8,9] These clinics provide treatment, including immunization. Referrals to other tertiary health care centres are also done if needed.^[10,11] As already mentioned, assessing the nutritional status of children is of utmost public health importance as it will aid in identifying the underlying causes, risk factors and barriers and facilitators to proper nutrition among children and also help to develop policies, programs and awareness campaigns addressing nutritional issues. With this background, the current study was conducted in the Well Baby Clinic of a Tertiary Care Institute of Kolkata, among under-5 children to find out their nutritional status and factors associated with it, and also to identify any associated sociodemographic characteristics of the children with their nutritional status.

Method:

Study type, design, and study setting: A crosssectional study was conducted among under-5 children attending the Well Baby Clinic (WBC) located at Khidirpur Maternity Home (KMH), which is under Institute of Post Graduate Medical Education and Research (IPGME&R) and Seth Sukhlal Karnani Memorial (SSKM) Hospital, Kolkata, India.

Study duration and study participants: The study was conducted for a period of 3 months (May 2023 to July 2023). The study participants were the under-5 children (0-59 completed months) who attended the WBC during the study period.

Inclusion and Exclusion criteria: The study included under-5 children attending the WBC, not yet diagnosed with undernutrition, wasting, stunting, or anemia. The study excluded all those participants whose caregivers were unwilling to give consent to participate in the study. Children with any existing infection/severely ill, or congenital anomaly were excluded.

Sample size and sampling technique: The sample size was calculated using Cochran's formula, which is as follows: Z_{α}^{2} pq/d² [Where Z= standard normal deviate, p= prevalence, q= (1-p), d= absolute precision]. Considering Z as 1.96, p as 50% or 0.05 (p= prevalence of severely underweight status among under-5 children) and d as 10%, the sample size was calculated as 96. After taking a 10% non-response rate, the final sample size obtained was 106. The children who fulfilled the selection criteria were included in the study by a

consecutive sampling technique to achieve the desired sample size.

Study tools and study technique: An anonymous, predesigned, pretested, and structured schedule was employed to obtain data from the caregivers of the eligible beneficiaries. It contained a mixture of openended and semi-open, single and multiple-response questions and was initially developed in English. The schedule was then translated into Bengali and Hindi by respective language experts and then retranslated back to English to ensure validity. It collected data across the domains of sociodemographic characteristics of the study participants, birth and feeding history, history of any past illness in the last 6 months and anthropometry [height/length, weight, mid upper arm circumference (MUAC)], general examination findings (pallor, oedema, cyanosis, clubbing, icterus, skin turgidity, presence of Bitot's spots) and haemoglobin levels using a Hemoglobinometer. The proforma was validated for its content by three subject experts- two from the Department of Community Medicine and one from the Department of Paediatrics of IPGME&R and SSKM Hospital, and necessary changes were incorporated before pretesting it. Pretesting was done on 15 under-5 children who were later excluded from the final sample. The WBC at KMH operates for two days in a week-Wednesday and Friday, hence data were collected on these two days every week during the study period, by a consecutive sampling technique till the desired sample size was achieved. After obtaining informed written consent from the caregivers of study participants who fulfilled the selection criteria, face-to-face interviews were conducted using the schedule, along with anthropometric measurements and haemoglobin levels (to check for the presence of anaemia). The study tools utilized in this study are summarized as follows-

- i) Predesigned, pretested, and structured schedule (face-to-face interviews)
- ii) Measuring tape (height, for children of > 24 completed months, MUAC)
- iii) Infantometer (length, for children of ≤ 24 completed months)

- iv) Salters' weighing scale (for children of < 12 months)
- v) Weighing machine (for children of ≥ 12 completed months)
- vi) Hemoglobinometer (for checking the presence of anaemia)

Study variables: Independent variables were the sociodemographic characteristics of the study participants. The dependent variable was the nutritional status.

Statistical analysis: Data were tabulated in Microsoft Office Excel 2021 and analysed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive analyses were represented using Mean (± SD), frequency and percentage and with the help of appropriate diagrams. Nutritional status was categorized into Normal [0 to -2 S.D.], Underweight [< -2 S.D. to -3S.D.] and Severely underweight [<-3 S.D.] (as per WHO Growth chart for weight for age).^[12] Anaemia was classified as- Hb levels <7 g/dl- (severe), 7-9.9 g/dl-(moderate) and 10-11.9 g/dl (mild).^[13] Multivariable Binary Logistic Regression analyses was performed to identify any associations between the sociodemographic characteristics of the study subjects with their nutritional status. All the variables having a p-value <0.2 in the univariate logistic regression analyses were considered biologically plausible and included in the multivariable model to check for model fitness, after checking for multi-collinearity (variance inflation factor > 10 and tolerance <0.1). A p-value of < 0.05 at 95% Confidence Interval (CI) was considered statistically significant.

Ethical considerations: The Proposal was submitted, and ethical clearance was obtained from the Institutional Ethics Committee (IEC) of IPGME&R and SSKM Hospital, Kolkata (**IPGME&R/IEC/2023/785**). Informed written consent was taken from the caregivers of the study participants. Anonymity and confidentiality of data were maintained throughout the study.

Results:

A. Sociodemographic data:

Among the study participants, 72.6% belonged within 12-24 completed months, 70.8% were male

children, and 92.2% followed Islam. Among the participants, 73.2% belonged to Lower-middle (Class IV) socioeconomic status (as per Modified B.G. Prasad Scale, updated in 2023). (Table 1) Among the participants, 9 (8.5%) were diagnosed with hypothyroidism and were on regular medications for the same. Nearly 76% of caregivers did not know about the ICDS (Integrated Child Development Services Scheme) program operating in full swing in India. Among the children, 97.2% were fully immunized till date.

B. Birth details and feeding history:

All of the eligible study participants were delivered at healthcare institutions (100%), out of which 77.3% were delivered by Caesarean section. Almost 16% were preterm at birth while 2.8% were post-term deliveries as reported by respective caregivers. Breastfeeding was initiated within 1 hour of birth in majority (88.6%) of the participants. Nearly 75.5% of children had history of Exclusive Breast Feeding (EBF) till 6 completed months of age while 34% received formula feeds. Out of the children who were \geq 6 completed months of age, almost 44% were started with complementary foods from 6 completed months of age, the most commonly given food items being rice, daal (lentil soup), biscuits and khichdi. Among the subjects, 11.3% consumed junk food for \geq 5 days/week.

Only 4 (3.8%) children were receiving Iron and Folic Acid (IFA) supplementation (according to the dosage and schedule mentioned under the 'Anemia Mukt Bharat' program guidelines) while 63.2% children never received Vit. D drops. 5 (4.7%) had a history of worm infestation in the last 12 months out of which only 2 of them took medication [two tablets of Albendazole (400 mg), two weeks apart].

C. Anthropometry and biochemical profile:

MUAC was reported to be <11.5 cm in only 1 (1.8%) and between 11.5-12.5 cm in only 2 (3.6%) of the subjects belonging to ≥ 6 months of age, respectively.

Clinical pallor was found in 9.4% and icterus in only 1 (0.9%) child. The skin turgor reaction was > 3 seconds in only 1 (0.9%) child. anaemia was reported to be 'Moderate' in 39.6% and 'Severe' in 8.5% of the children.

Table 1	. Distribution of Study Participants According
	to their Sociodemographic Characteristics
	(N=106)

Sociodemographic Characteristics	n (%)	
Age of the participants		
Neonate (0 to 28 days)	17 (16.0)	
29 days to 24 completed months	81 (76.4)	
24- 60 completed months	8 (7.5)	
Gender of the participants		
Male	57 (54.0)	
Female	49 (46.0)	
Residence		
Urban	100 (100)	
Religion		
Hinduism	15 (14.0)	
Islam	91 (86.0)	
Education of caregiver - Father		
Illiterate	12 (11.3)	
Primary	7 (6.6)	
Middle school	19 (17.9)	
Secondary	29 (27.3)	
Higher secondary	21 (19.8)	
Graduate and others	18 (17.0)	
Education of caregiver - Mother		
Illiterate	4 (3.7)	
Primary	6 (5.6)	
Middle school	22 (20.7)	
Secondary	25 (23.5)	
Higher secondary	23 (21.6)	
Graduate and others	23 (21.6)	
Occupation of caregiver - Father		
Unemployed	5 (4.7)	
Employed	101 (95.3)	
Occupation of caregiver - Mother		
Homemaker	99 (93.4)	
Employed	7 (6.6)	
Socio-economic Status (Modified B.G.		
Prasad Scale, updated on 2023)		
Class I (Upper)	2 (1.9)	
Class II (Upper middle)	5 (4.7)	
Class III (Middle)	14 (13.2)	
Class IV (Lower middle)	85 (80.2)	
Presence of siblings	~ /	
Yes	59 (55.7)	
No	47 (44.3)	

	Moderately underweight (n= 20)			Severely underweight (n= 18)		
Sociodemographic	Frequency	AOR (95%	p value	Frequency	AOR (95%	p value
characteristics	(%)	Confidence		(%)	Confidence	
		Interval)			Interval)	
Age of the participants						
Neonate (0 to 28 days)	4 (20.0)	0.82 (0.49-13.79)	0.89	5 (27.7)	0.72 (0.03-17.32)	0.84
29 days to 24 completed months	14 (70.0)	1.58 (0.11-22.90)	0.73	12 (66.7)	0.86 (0.04-18.12)	0.92
24- 60 completed months	2 (10.0)	Ref.		1 (5.6)	Ref.	
Gender of the participants						
Male	11 (55.0)	4.10 (1.20-14.02)	0.02	10 (55.6)	1.31 (0.30-5.69)	0.03
Female	9 (45.0)	Ref.		8 (44.4)	Ref.	
Child going to ICDS/School						
Yes	5 (25.0)	1.35 (0.29-6.24)	0.69	3 (16.7)	0.77 (0.11-5.22)	0.79
No	15 (75.0)	Ref.		15 (83.3)	Ref.	
Child immunized till date						
Yes	15 (75.0)	0.94 (0.20-4.4)	0.94	15 (83.3)	0.45 (0.79-2.58)	0.37
No	5 (25.0)	Ref.		3 (16.7)	Ref.	
H/O Hypothyroidism in any parent						
Yes	5 (75.0)	0.85 (0.13-5.56)	0.87	3 (16.7)	2.74 (0.39-19.01)	0.30
No	15 (25.0)	Ref.		15 (83.3)	Ref.	

 Table 2. Multivariable Multinomial Logistic Regression Showing the Association of Sociodemographic

 Characteristics of Study Participants With their Nutritional Status (N=106)

Ref. cat. = normal weight-for-age

Model fitness information: Omnibus Test of Model Coefficients was statistically significant, (p=0.01) and Hosmer-Lemeshow Goodness of Fit Test was not statistically significant (p=0.97)

The majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight' (as per the WHO Growth chart for weight-for-age, from birth till 5 years of age).

Multivariable Multinomial Logistic Regression analyses revealed that female children had statistically significantly higher odds of being moderately underweight (aOR= 4.10, 95% CI 1.20-9.72; p 0.02) and severely underweight as compared to the male children. (aOR= 1.31, 95% CI 0.30-5.69; p 0.03). The model fitness information was given by the Omnibus Test of Model Coefficients, which was statistically significant (p=0.01), and by the Hosmer-Lemeshow Goodness of Fit Test, which was not statistically significant (p=0.97). These findings suggested a good fit of the model. (Table 2)

Discussion:

In a study done by Mahmood S et al.^[14], malnutrition was found to be present in 32% of children. Adequately nourished children were 68%, while moderately and severely malnourished children were 14% and 18%, respectively. The present study indicated malnutrition to be significantly associated with maternal illiteracy and the presence of a family member with special needs. No significant association was found between malnutrition and gender, family size, family income, breastfeeding, and presence of siblings under 5 years of age. In contrast, in the current study, the majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight' (as per the WHO Growth chart for weight-for-age, from birth till 5 years of age). The children whose mothers were illiterates also had statistically significantly higher odds of being severely underweight as compared to the mothers who were literate.

Another study done by Khadija U et al.^[15], the study found that 27.2% mothers were belonged to stunted children, 17.3% belonged to wasted children, and 50.9% belonged to those children who were suffering from both stunting and wasting condition. 57.9% mothers who were illiterate belong to stunted and wasted children. CBC and Hb test were prominent, stunted and wasted children had Hb 9.88 mg/dL. The average height and weight of stunted and wasted children was 68.6 cm and 7.11 kg respectively. But in the present study, majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight' (as per WHO Growth chart for weight-forage, from birth till 5 years of age). Anaemia was reported to be 'Moderate' in 39.6% and 'Severe' in 8.5% of the children. The children whose mothers were illiterates, also had statistically significant higher odds of being severely underweight as compared to the mothers who were literates.

A study conducted by Bhusal CK et al.^[16], about half of Muslim children were underweight, 0.9% were overweight, 17.3% were wasted and 63.1% were stunted. Also in the study, underweight, wasting and stunting in under-five Muslim children were above the cutoff point from the significant level of public health and higher than national data. Hence, this study suggests collaborative and immediate attention from responsible governmental and non-governmental organizations working in nutrition for providing informal learning opportunity. But in the present study, the majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight'.

In study done by Chapagain R et al.^[17], most participants were male (65.1%); mean age was 3.9 years (\pm 3.4 years). The prevalence of stunting was 25.9 %, wasting was 17.3% and 24.0% when classified by BMI-for-age Z-score or MUAC, respectively. Two percent of participants were overweight. Notably, 32.1% of children \geq 5 years were classified with wasting based on

MUAC-for-age Z-score, which is higher than that observed in children <5 (20.2%). Food insecurity was reported among 58.2% of children with stunting and 34.0% with wasting. In contrast, in the current study, the majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight' (as per the WHO Growth chart for weightfor-age, from birth till 5 years of age). The children whose mothers were illiterates, also had statistically significant higher odds of being severely underweight as compared to the mothers who were literates.

Hamann SA et al.^[18], conducted by the proportion of obesity, overweight, underweight, and stunting among school children was 4%, 12%, 7%, and 17%, respectively. More girls were overweight/obese compared with boys (20% vs. 13%). The mixed-effects logistic regression model showed that both participants from Lower SES households and Upper SES households had a higher tendency to be overweight compared to participants from Middle SES respectively. In contrast, in the current study, the majority of children had normal weight-for-age (64.1%), 18.9% were 'Underweight', while 17% were 'Severely underweight' (as per the WHO Growth chart for weight-for-age, from birth till 5 years of age). The children whose mothers were illiterates also had statistically significantly higher odds of being severely underweight as compared to whose mothers were literate.

Strengths and Limitations:

The study focused on the nutritional status of underfive children in a WBC, which may allow for the early identification of potential nutritional deficiencies and poor growth and development, so that accurate measures can be taken promptly. It also provided insight into the prevalence of underweight or anaemia in a vulnerable age group like under-five children.

A larger sample size could have been obtained had the clinic operated on a regular basis. Also, since the current study was conducted only in one WBC, the nutritional status of the under-five children, along with the factors associated with it could not be compared with those provided by other WBCs located at other parts of the state or country.

Conclusion and Recommendations:

Majority (72.6%) children were within 12-24 completed months. Nearly one-fifth were severely underweight and very few (8.5%) had severe anaemia. Nutritional status significantly associated with gender of children and education of mothers.

Improving the underweight status and anaemia requires a multi-faceted approach, combining various appropriate nutritional interventions, healthcare measures and broader socioeconomic strategies. Improving the IYCF (Infant and Young Child Feeding) practices among the caregivers, counselling regarding iron supplementations and provision of iron fortified food along with periodic deworming, use of clean water, proper sanitation and hygiene practices and improving the maternal nutrition can help mitigate the problem. Consistent measures must be put in to generate awareness, strengthen the health care delivery standards to combat these nutritional issues.

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Conflict of Interest: Nil

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