Original Article

What matters in good health status of 1-year-old children? – A cross-sectional study of the perinatal factors

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Abstract

Background: A healthy child can make way for a healthy adult. Some of the factors that can be used to determine the health of a young child are nutritional status of the child, the developmental milestones achieved, and frequency of illness. **Objectives:** The health status of children and associated factors are determined. **Methods:** This is a community-based cross-sectional study with 271 participants. The height and weight of the child were measured; questions were asked regarding developmental milestones achieved and frequent illnesses. An interview schedule was used to enquire about the determinants of health status. Descriptive statistics were done; Chi-square test and regression were used to determine association between the health status of children and determinants. **Results:** A total of 127 (46.86%) were found to have a good health status. Family type (Chi square value 9.568; *P* value = 0.002), birth spacing (Chi square 20.540; *P* value < 0.001), term or pre-term birth (Chi square 4.598; *P* value = 0.032), chronic medical problem in the child (Chi square 11.074; *P* value = 0.001), and immunization status of the child (Chi square 5.666; *P* value = 0.017) were found to have significant association with the health status of the child. By logistic regression, pre-term child birth and family type were found to have higher odds. **Conclusion:** For better health of the child, specific focus on birth spacing, term birth of baby, better care of the ill, and complete immunization play vital roles.

Keywords: Birth spacing, chronic medical problem, health status, immunization, nutritional status

Introduction

Children account for a large proportion of the population of the nation. The health and nourishment that the children gain in the early phase of their lives not only make them healthier at that point of time but also provide a firm foundation for good health throughout their lives.

The first few years of life are the crucial years because vital development takes place in all body systems of the child, especially the brain.[1] Longitudinal studies suggest that the foundations of obesity, hypertension, cardiovascular diseases, and certain mental disorders may be laid in early life.[1] Addressing the health needs of under-5 children will be a predominant area of practice for primary care providers and family physicians. Certain factors playing a key role are as follows:

Nutrition: In India, 19.3% of children under 5 years of age suffer from wasting[2] due to acute under-nutrition, 32.1% are underweight,[2] and 35.5% are stunted due to chronic under-nutrition.[2] India accounts for more than 3 out of every 10 stunted children in the world.[3] In Maharashtra, among 0 to 5 years old children, 35.2% are stunted, and about 36.1% are underweight; wasting affects 25.6%.[4]

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Developmental milestones: Developmental delay is estimated to be present in about 10% of the children.[5] Poverty increases risk and exposes the child to many other risk factors such as lack of stimulation or excessive stress, malnutrition, exposure to environmental toxins, and concurrent diseases that adversely affect development.[5]

Frequent occurrence of illness: This leads to malnutrition; malnutrition further affects the immunity of the child and makes the child vulnerable for recurrent illness. This acts as a vicious cycle.

Determinants

Effective antenatal care (ANC) can improve the health of the mother and give her a chance to deliver a healthy baby.[6] A non-breastfed child is 14 times more likely to die of all causes in the first 6 months of life than an exclusively breastfed child.[7] It is important to ensure exclusive breastfeeding of all babies as it saves babies from morbidities like diarrhea and pneumonia.[8] Around 2.5 million under-5 deaths are prevented annually by routine immunization.[9]

Child morbidity and malnutrition are marked in urban slum areas, the reasons being over-crowding, poor ventilation, and poor hygiene. Under-nutrition, repeated illnesses, child labor, and so on contribute to their ill health.[1]

The objective of this study is a wholesome approach to determine the health status of the child and the socio-demographic and perinatal factors that can influence the same. This study has important public health and primary care utility in early action possibility for better health in the infant and the under-5 age group, which are the most vulnerable years of any individual.

Material and Methods

The present cross-sectional observational study was conducted in an urban slum area in Mumbai. This was a community-based study with a total duration of 18 months. An urban slum area catered by the medical college and tertiary care hospital was chosen. The population of the area is 52,902 (source-health post of the area). Children who completed 1 year of age approximate to 1587. After calculation, based on prevalence of malnutrition, which is 22.7%,[10] and considering the same trend during the study period, the sample size was estimated to be 271. The formula used was $n >= Z^2pqN/e^2(N-1) + Z^2pq$. Ethical clearance was taken from Institutional Ethics Committee. The study involved children who have completed 1 year of age but below 18 months along with their mothers. To reduce the chances of recall bias, this age group was chosen. Children or their mothers who were severely ill were excluded from the study. All consenting participants meeting the eligibility criteria were enrolled. Simple random sampling was used to enrol study participants. A table of random numbers was used to decide the lane and house number to be selected, and the family was approached. If a child meeting inclusion criteria was not found in that house, the next house was approached till a child was enrolled. Once a child was found, consent was requested from the mother and interview was taken using a semi-structured interview schedule. Questions regarding the socio-demographic details; antenatal, natal, and postnatal care; developmental milestones achieved; and episodes of illnesses the child suffered were enquired about. Anthropometric measurements of the child were taken – height or length using a measuring tape taken to the accuracy of 0.1 cm and weight using a weighing machine to the nearest 0.1 kg. It was one time contact with the study participant to collect the data. Again, the same procedure was repeated to enrol the next child till a maximum of six children were enrolled from one building. Then a random number was chosen to decide the next building and subsequently the next child. This was repeated till a total of 271 children were enrolled for the study. Analysis was done using SPSS Version 23. If there were any missing data, the mother of the participant was called up and the desired data were taken down. Regarding descriptive statistics, proportion was used for socio-demographic factors. The health status of the child was defined as good if the height for age, weight for age, and weight for height were above (-2) Standard Deviation (SD); no developmental delay and frequency of illnesses was <10 episodes till date.[11] If any of these parameters was not meeting the mark, the health status of the child was considered poor. Association of each epidemiological factor with outcome, that is, health status of the child, was assessed by Chi-square test. Binary logistic regression was applied on factors with significant association with health status of the child.

Results

The independent variables can be broadly classified as socio-demographic factors, antenatal factors, intra-natal, and postnatal factors. To determine the association between the independent variable and outcome, Chi square test was used.

Descriptive data are as shown in Table 1. It was just one contact with the study participant, and hence, no attrition was observed. Among 271 participants, 149 (55%) were males [Figure 1]. The majority, 145 (53.5%), belonged to the upper-middle class according to modified Kuppuswamy socio-economic classification. 130 (48%) children were enrolled in an under-5 clinic. The mean age of children enrolled was 15.4 months with a standard deviation of 1.9 months (15.4 ± 1.9). The mean height of children was 75.8 ± 4.5 cm, and the mean weight of children was 9 ± 1.4 kg.

A total of 127 (46.86%) children were found to have a good health status [Figure 2].

Most of the children were from a nuclear family, 159 (58.7%). The majority, 127 (46.9%), were first child, and the most common spacing between births was 3 to 5 years in 70 (25.8%); 35 (12.9%) of the mothers suffered from chronic illness. Twelve (4.4%) were pre-term deliveries, 57 (21%) were low-birth-weight babies, and 30 (11.1%) had NICU admission. A total of 220 (81.2%) mothers had given exclusive breastfeeding for at least 6 months

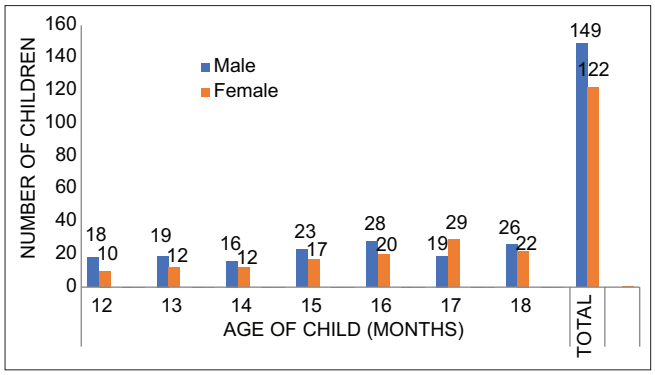

Figure 1: Age-wise and sex-wise distribution of children in the study

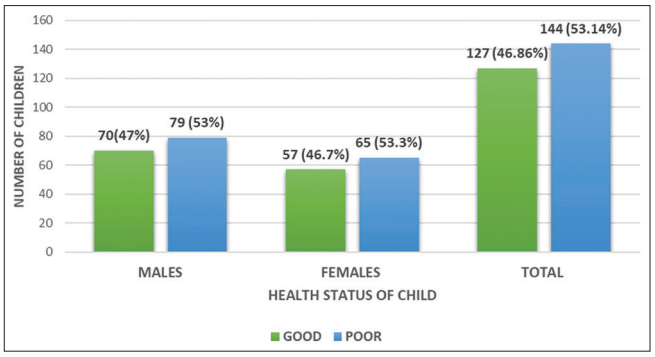

Figure 2: Distribution of children based on health status – sex- wise distribution

Table 1: Socio-demographic details of the study participants

Characteristic	Number	Percentage
Total number of children		
Males	149	55%
Females	122	45%
Mother's age		
18–30 years	195	72%
>30 years	76	28%
Father's age*		
21–40 years	252	93%
>40 years	18	6.6%
Religion		
Hindu	186	68.6%
Muslim	35	12.9%
Christian	2	7%
Buddhist	48	17.7%
Socio-economic status		
Upper lower	37	13.7%
Lower middle	70	25.8%
Upper Middle	145	53.5%
Upper	19	7.0%
Under-5 Clinic enrolment		
Yes	130	48%
No	141	52%

*1 child's father has expired

to their infants, and 261 (96.3%) were completely immunized till age. Twelve children (4.4%) had chronic medical problems.

Determinants for health status

Family type (Chi square value, 9.568; *P* value = 0.002), birth spacing (Chi square value, 20.540; *P* value < 0.001), whether the child was pre-term (Chi square value 4.598; *P* value = 0.032), chronic medical problem in the child (Chi square value 11.074; *P* value = 0.001), and immunization status (Chi square value 5.666; *P* value = 0.017) were found to have significant association with the health status of the child.

By applying binary logistic regression on factors with significant association – family type, birth spacing, time of delivery, chronic medical problem, and immunization status, the pre-term birth (OR 1.99; 1.028–3.859 at 95% CI) was found to increase the risk of poor health status by 2 folds. The type of family, joint family (OR 0.547; 0.312–0.959 at 95% CI), was found to be protective by 46% from poor health status. After backward logistic regression, the absence of chronic medical problems in the child was found to be protective from the poor health status of the child (OR 0.211; 0.061–0.737 at 95% CI); that is, the presence of chronic medical problems was associated with a poor health status.

Discussion

In the present study, 271 children between 12 and 18 months were enrolled. Birth spacing, type of family, pre-term or term birth, chronic medical problems in the child, and immunization status of the child were found to have significant association with the health status of the child.

A total of 195 (72%) of the mothers of the children enrolled for the study were 18 to 30 years of age; 252 (93%) of the fathers of the children were 21 to 40 years of age [Table 1]. These age groups are optimum for child-bearing. None of the parents were below the lower limit for the child-bearing age group (for mothers <18 years and for fathers <21 years). In the study of Pravana NK *et al.,*[12] the majority of the mothers were aged between 20 and 34 years (74.3%).

The majority of the families, 145 (53.5%), were upper-middle class, followed by lower-middle class, 25.8% [Table 1], according to modified Kuppuswamy classification. In study by A Jeyakumar *et al.*,[13] 35% of the families were in upper and upper middle classes.

Determinants of Health Status

A total of 127 (46.86%) children were found to have a good health status; that is, the height for age, weight for age, and weight for height were above -2SD; no developmental delay and frequency of illnesses was <10 episodes since birth till date [Figure 2].

Socio-economic status

In a study by Devi *et al.*,[14] association was present with severe acute malnutrition (SAM) and socio economic status (*P* value 0.002). In Aldana-Parra *et al.*[15] study, wealth index did not have significant association with wasting in children (*P* value 0.12)

Family type

Type of family was found to have significant association with health status of the child with 62 (39%) having a good health status in a nuclear family and 65 (58%) having a good health status in a joint family, *P* value = 0.002 [Table 2]. In a study by Chhabra *et al.*,[16] family type was not found to have significant association with occurrence of wasting in the child (*P* value = 0.26). In a study by Gilano *et al.*,[17] a household size of >6 was found to have positive association with stunting (coefficient = -5.53). In Meshram *et al.* study,[18] under-nutrition was found to be more in a nuclear family with OR of 1.57 for underweight, 1.35 for stunting, and 1.40 for wasting.

In a joint family, there will be many members to take care of timely nutrition of children and in company of siblings and cousins, children are more likely to eat well and be active and playful, enabling a better health status. Also, there is a joint pool of income, compensating for any loss incurred financially, individually.

ANC utilization

A total of 117 (48.5%) of the individuals who had completely utilized the ANC care had a good health status but no significant association (*P* value = 0.115). In a study by the difference present between chances of stunting and number of ANC visits was significant, *P* value <0.001. In study, 84.9% of mothers had taken folic acid supplements during pregnancy (*P* value 0.81).

Term birth

A total of 259 (95.6%) had term delivery and had significant association, with a *P* value of 0.032 [Table 2]. In a study by W-C Chiu *et al.*,[19] significant association was present between term/pre-term pregnancy and developmental delay [Table 3], *P* value <0.001. In Hochstedler *et al.*[20] study, children delivered before 32 weeks of gestation had developmental delay with adjusted OR of 13.08, 5.06, and 6.96 for gross motor, fine motor, and communication, respectively, whereas for children delivered before 37 weeks, the adjusted OR was 1.89, 1.30, and 2.19, respectively.

Period of gestation and term/pre-term birth of the baby will greatly influence the extent of growth and development of the child at birth. Better development gives scope for better survival and development in future.

Birth order

A total of 246 (90.8%) of the study participants had a birth order up to 3. Good health status was seen in 48% of the children with a birth order up to 3, with only 36% with more than 3 (*P* value = 0.253) [Table 2]. In a study by Ambadekar *et al.*,[21] birth order >2 was found to be associated with SAM with OR of 5.1. In Siddiqa M *et al.* study,[22] birth order had significant association with stunting in under-5 children (*P* value = 0.02) and no significant association with underweight (*P* = 0.17) and wasting (*P* = 0.44).

Birth spacing

In the first-born child, the health status was good in 61.4% of the children, and with increasing birth interval, more children were having a good health status (*P* value < 0.001). In a study by Takele *et al.*,[23] there was no significant association between stunting and birth interval, *P* value 0.893. In a study by Batiro B *et al.*,[24] birth interval (of 2 years) and stunting were significantly associated with an adjusted odds ratio of 3.27.

Table 2: Association of socio-demographic and antenatal factors with health status of the child

Characteristic	Good (%)	Poor (%)	Total (%)	Chi-square value	*P*
Socio-economic status					
Lower	19 (50)	19 (50)	38 (14)	0.183	0.912
Middle	99 (46.3)	115 (53.7)	214 (79)		
Upper	9 (47.4)	10 (52.6)	19 (7)		
Family type					
Nuclear	62 (39)	97 (61)	159 (58.7)	9.568	0.002
Joint	65 (58)	47 (42)	112 (41.3)		OR-0.547; 0.312–0.959 95%CI
Birth spacing					
First child	78 (61.4)	49 (38.6)	127 (46.9)	20.540	<0.001
<3 years	19 (33.9)	37 (66.1)	56 (20.7)		
3-5 years	23 (32.9)	47 (67.1)	70 (25.8)		
>5 years	7 (38.9)	11 (61.1)	18 (6.6)		
Birth order					
Up to 3	118 (48.0)	128 (52)	246 (90.8)	1.305	0.253
>3	9 (36)	16 (64)	25 (9.2)		
Maternal chronic illness					
Yes	16 (45.7)	19 (54.3)	35 (12.9)	0.021	0.884
No	111 (47)	125 (53)	236 (87.1)		
ANC Interventions					
Completely utilized	117 (48.5)	124 (51.5)	241 (88.9)	2.480	0.115
Partially utilized	10 (33.3)	20 (66.7)	30 (11.1)		
First Antenatal Checkup					
1st Trimester	109 (85.8)	115 (79.9)	224 (82.7)	1.675	0.196
2nd/3rd Trimester	18 (14.2)	29 (20.1)	47 (17.3)		

The pregnant woman and family members would have been more careful and paying attention during first pregnancy providing the best amenities. This justifies a better health status of the first-born child. With increasing birth interval, the mother's health would have better restored facilitating a healthier child.

Birth weight

43.9% children with a low birth weight and 47.7% with a normal birth weight had a good health status, with no significant association (a *P* value of 0.609) [Table 3]. In a study by Khandelwal N *et al.,*[25] global developmental delay was found in 94% of the children with a low birth weight (*P* value = <0.001). In Kirsten Ann Donald *et al.* study,[26] developmental delay was found to be associated with birth weight of the child in all four domains (1.61 times for cognitive development, 1.02 times for receptive language, 0.79 times for expressive language, and 0.7 times for fine motor development). In a systematic review by Katoch OR,[27] child's birth weight was found to be a consistent factor in malnutrition among children.

Chronic medical problems in children

A total of 12 (100%) of the children with chronic medical problems had a poor health status. Among children without chronic medical problems, 49% had a good health status, with significant association present, *P* value = 0.001 [Table 4]. In Batte *et al.* study,[28] 31.5% had wasting, 42.5% were underweight, and 45.4% were stunted in chronically ill children. In study, 13 children with chronic illness were found to have development delay. In Heye *et al.* study,[29] children with chronic illness and history of ICU admission were found to have adverse effects on neurodevelopmental outcome.

Chronic medical problems mainly included congenital heart disease, neurological disorder, bronchial asthma, and hematological disorder. These children were prone for frequent occurrence of infections and repeated hospitalizations and were featured by failure to thrive. This led to feeding difficulties, poor weight gain, and poor nutritional status. Developmental delay was seen in a few, ones with neurological disorder. In this way, chronic illness affected each parameter considered individually as well as the overall health status of the child.

Exclusive breastfeeding

A total of 220 (81.2%) were given exclusive breastfeeding till at least 6 months of age (*P* value of 0.732) [Table 4]. In a study by exclusive breastfeeding was given till 6 months of age in 58.6%; the *P* value was 0.30 for stunting. In a study by Saleem *et al.*,[30] early stoppage of exclusive breastfeeding was found to be associated with developmental delay (*P* value 0.01). In Asfaha *et al.*[31] study, a child who was not exclusively breastfed for 6 months was found to have increased susceptibility to diarrhea with an OR of 4.84 (2.21–10.60 at 95% CI).

Colostrum, rich in antibodies, is fed to the baby if breastfeeding is initiated within a day of birth. Breastfeeding provides protective antibodies to the child and plays a vital role in boosting the immunity of the child, protecting it from infection. Exclusive breastfeeding provides complete nutrition to the child till

Table 3: Association of intra-natal factors with health status of the child

Characteristic	Good (%)	Poor (%)	Total (%)	Chi-square value	*P*
Time of Delivery					
Term	125 (48.3)	134 (51.7)	259 (95.6)	4.598	0.032
Preterm	2 (16.6)	10 (83.3)	12 (4.4)		OR-1.99; 1.028–3.859 95%CI
Birth Weight					
>=2.5 kg	102 (47.7)	112 (52.3)	214 (79.0)	0.262	0.609
<2.5 kg	25 (43.9)	32 (56.1)	57 (21.0)		
NICU Admission					
Yes	11 (8.7)	19 (13.2)	30 (11.1)	1.409	0.235
No	116 (91.3)	125 (86.8)	241 (88.9)		

Table 4: Association of postnatal factors with health status of the child

Characteristic	Good (%)	Poor (%)	Total (%)	Chi-square value	*P*
Exclusive breastfeeding					
<6 months	25 (49.0)	26 (51.0)	51 (18.8)	0.117	0.732
>=6 months	102 (46.4)	118 (53.6)	220 (81.2)		
Chronic medical problem					
Yes	0 (0.0)	12 (100.0)	12 (4.4)	11.074	0.001
No	127 (49.0)	132 (51.0)	259 (95.6)		OR-0.211; 0.061 – 0.737 95% CI
Immunization status					
Completely immunized	126 (48.3)	135 (51.7)	261 (96.3)	5.666	0.017
Partially immunized	1 (10.0)	9 (90.0)	10 (3.7)		
Resumed job					
<6 months after delivery	16 (12.6)	8 (5.6)	24 (8.9)	5.021	0.081
6-18 months after delivery	24 (18.9)	23 (16.0)	47 (17.3)		
Not yet joined/home maker	87 (68.5)	113 (78.5)	200 (73.8)		

6 months of age. However, in this study, significant association was not found.

Immunization status

In completely immunized, 51.7% had a poor health status, whereas in partially immunized/unimmunized, 90% had a poor health status, with significant association present, (*P* value 0.017) [Table 4]. In a study by Engebretsen *et al.*[32] on immunzation and nutritional status, wasting and stunting, the odds ratios were 0.68 and 0.63, respectively. In Aristegui *et al.* study,[33] rotavirus vaccination and AGE had significant association, *P* value 0.001. In Hossain *et al.* study,[34] missing BCG vaccination and wasting had significant association ($p < 0.001$). In a study by Danso and Appiah, partially vaccinated children were 2.98 times more likely to be stunted than those fully vaccinated (aOR, 2.98; 95% CI, 1.62–7.66; $P = 0.023$).[35]

Complete immunization at 1 year shows that the child is protected from the vaccine preventable, life-threatening diseases and does not suffer associated debilitation. This provides scope for the child to thrive and have a better health status. Additionally, complete immunization reflects that the mother has better awareness, compliance, and access to health care services influencing the child's health status favorably.

The strengths of the study are that nutrition, development, and susceptibility to infections have been considered to define health status – all these parameters play a key role in defining child health in developing countries and encompass important factors used to define child health. The determinants of child health will help the primary care physicians and family physicians to develop a comprehensive outlook in dealing with childhood illnesses. Antenatal, natal and postnatal factors have been evaluated in determinants – providing a wholesome approach. The limitations of this study include inability to perform laboratory investigations due to financial and logistic constraint – this can provide scope for further research in this topic. The questions regarding the antenatal period have also been asked; in some cases, this spanned as long as 2 years back, so there may be recall bias. However, we have tried to overcome this limitation by restricting the enrolment of children only up to 18 months, that is, 6 months post completion of infancy.

This has been a community-based study in urban slum areas, and simple random sampling is used to enrol study participants, so the results can be generalized to children in all urban slum areas. The study states the important factors associated with the health status of children.

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Conflicts of interest

There are no conflicts of interest.

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