



Risk factors for under-nutrition among children aged one to five years in Udupi taluk of Karnataka, India: A case control study

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RESEARCH

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Abstract

Background

Despite her apparent economic success, India is plagued by a high burden of under-nutrition among children under five. This study was aimed at understanding some of the risk factors for under-nutrition in a region with favourable maternal and child health indicators.

Method

A case control study was carried out among children aged one to five years attending the paediatric outpatient department in six rural health care centres in Udupi taluk of Karnataka in Southern India. A total of 162 children were included in the study, of which 56 were cases. A semi-structured questionnaire was used to interview the caregivers of the children and the nutritional status was graded according to the Indian Academy of Paediatrics (IAP) grading of protein-energy malnutrition.

Results

Under-nutrition was associated with illness in the last one month [OR- 4.78 (CI: 1.83 -12.45)], feeding diluted milk [OR- 14.26 (CI: 4.65 – 43.68)] and having more than two children with a birth interval ≤ 2 years [OR- 4.93 (CI: 1.78 – 13.61)]. Lack of exclusive breast feeding, level of education of the

caregiver and environmental factors like source of water did not have an association.

Conclusion

Childhood illness, short birth interval and consumption of diluted milk were some of the significant contributory factors noted among this population. Information, Education, Communication (IEC) campaigns alleviating food fads and promoting birth spacing is needed.

Key words

Under-nutrition, childhood illness, breast feeding, birth interval, food fads

What this study adds

Despite favourable health indicators, poor feeding practices and improper birth spacing prevail and these need to be tackled in a regionally sensitive manner to prevent the problem of under-nutrition.

Background

Under-nutrition is one of the most common causes of morbidity and mortality among children throughout the world, more so in developing nations.¹ Being a major burden of ill health, it has been accountable for 60% of the 10.9 million deaths that occur annually among children under five years of age.² Data from UNICEF states that the highest level of underweight children is found in South Asia, involving 46% of all under-fives in the region.³

Under-nutrition continues to be a public health problem in India. With a prevalence of 43.5% in children under five years, it is observed to be amongst the highest in the world.⁴ In this age group 46% of children are reported stunted, 47% underweight and 16% wasted.⁵ There is also a wide disparity in the prevalence of under-nutrition amidst the states of India, ranging from high (55%) to relatively lower (27%).⁵

Udupi taluk of coastal Karnataka in South India is a region with favourable health indicators.⁶ Child under-nutrition, however, is an enduring problem. This study aimed to determine and analyse the prevailing risk factors leading to



under-nutrition in children between one to five years in this region.

Method

An unmatched case control study was carried out after obtaining ethical clearance from the Institutional Ethics Committee (IEC), Kasturba Hospital, Manipal, Manipal University. Study participants were children in the one to five year age group attending the under-five clinics at the rural healthcare centres under the aegis of a tertiary care medical school in the area. Cases were children in the one to five year age group with weight for age $\leq 80\%$ of the expected and not suffering from any chronic/severe illness. Controls were healthy children in the same age group with weight for age $> 80\%$ of the expected. The nutritional status was graded as per the Indian Academy of Paediatrics (IAP) grading of protein energy malnutrition (PEM).⁷

A semi-structured questionnaire was used to interview the caregivers of the study population. An informed consent was obtained prior to the interview. The respondents' socioeconomic status (SES) was assessed using a validated scale (Uday Pareekh).⁸ Details pertaining to child's growth, development and feeding practices were obtained using the questionnaire. Anthropometric measurements were computed using standard instruments. Weight was recorded using a standard weighing scale, kept on a firm horizontal surface to the nearest 500gm. Height was recorded using a mobile stadiometer to the nearest 1 cm.

Lack of exclusive breast feeding until six months was the risk factor considered, with an expected exposure of 23% in the controls⁹ and an anticipated Odds Ratio (OR) of three. Accordingly, the calculated minimum number of cases was 46 for a power of 80% and 5% level of significance. With a 1:2 allocation ratio the required number of controls were 92; thus a total of 162 individuals were included into the study, of which 56 were cases.

The data collected was tabulated and analysed using Statistical Package for Social Sciences (SPSS) version 15 for windows (SPSS South Asia, Bangalore). The findings were described in terms of proportion along with 95% confidence interval (CI). Risk was estimated using odds ratio with 95% CI. Multivariable logistic regression was used to identify the risk factors for under nutrition. Adjusted odds ratios with 95% CI were reported.

Results

The demographic features of the study population are as illustrated in Table 1. A total of 56 cases and 106 controls were recruited into the study. There was an almost equal

distribution among the cases controls with regards to traits such as age, gender and family type. Most of the cases (47) presented with Grade I and only one child was noted to have Grade III malnutrition.

Table 1: Demographic characteristics of the study population

N=162

| Demographic Characteristics | Cases N (%) | Controls N (%) |
|---|-------------|----------------|
| <u>Age Distribution</u> | | |
| 1 to 3 | 46 (82.1) | 94 (88.7) |
| >3 to 5 | 10 (17.9) | 12 (11.3) |
| <u>Gender</u> | | |
| Male | 30 (53.6) | 55 (51.9) |
| Female | 26 (46.4) | 51 (48.1) |
| <u>Family Type</u> | | |
| Joint | 29 (51.8) | 62 (58.5) |
| Nuclear | 27 (48.2) | 44 (41.5) |
| <u>Father's occupation</u> | | |
| Professional/skilled | 38 (67.9) | 94 (88.7) |
| Labourer/unemployed | 18 (32.1) | 12 (11.3) |
| <u>Socioeconomic status</u> | | |
| Middle/high | 38 (67.9) | 86 (81.1) |
| Low | 18 (32.1) | 20 (18.1) |
| <u>Interval between birth of two siblings</u> | | |
| Only one child | 0 (0) | 35 (33) |
| > 2 years | 31 (55.4) | 59 (55.7) |
| ≤ 2 years | 25 (44.6) | 12 (11.3) |

The majority of the respondents were mothers who were educated up to high school and beyond (94%) and were housewives. There was a slight preponderance of employed mothers among cases (30%) in comparison to the controls (18%). Short birth interval of ≤ 2 years was seen more among the cases as compared to the controls. Largely, the cases (82%) in the study population had suffered from illness in the past one month, either in the form of acute respiratory tract infection (ARI) or acute diarrhoeal disease (ADD).

Risk factors for under-nutrition: As the risk factors for under-nutrition are multipronged, we did a univariate analysis of these factors under various categories. A logistic regression was then carried out to adjust for the confounders and identify the factors that were truly associated.

Socio-demographic determinants: Socioeconomic status, family type and occupation of the parents were the factors



focused in this criterion. The only statistically significant association was father’s occupation. A child who was malnourished was three times at risk of having a father who was either a labourer or unemployed [OR = 3.71 (CI 1.63 – 8.4) p < 0.01].

Infant feeding practices: Factors such as initiation of breast feeding after 24 hours of delivery, exclusive breast feeding for less than six months and continuing to breastfeed after one year of age failed to show any association. Interestingly, consumption of diluted milk was associated with an increased risk [OR = 17.33 (CI 6.33 – 47.45) p < 0.01].

Child-related factors: All the factors studied under this category showed a significant association. Birth interval \leq 2 years was a significant predictive factor just as birth weight < 2.5Kg. A malnourished child was noted to have a six times risk of having suffered from either ARI or ADD in the last one month. Likewise, children with siblings were at an increased risk of under-nutrition.

Most of the unimmunised children belonged to the case group and this factor was found to have a significant association with under-nutrition in the univariate analysis [OR- 10.294 (CI: 1.172-90.424)].

A logistic regression analysis reiterated the association of factors such as low birth weight, feeding either diluted milk or absence of milk in the diet and having suffered an illness in the last one month with under-nutrition. Having more than two children with a birth interval of \leq 2 years was another significant factor observed to have an association. This is illustrated by the adjusted OR in Table 2.

Discussion

The study population was predominantly rural and the factors identified corroborate this setting. However, there was no significant association noted with low socioeconomic status as was the case in other rural settings.^{2, 10, 12} Poor family income is another factor that has been found to be a significant predictor for under-nutrition in studies done in some parts of Africa and India.¹³⁻¹⁶ This study shows a similar trend in that the father’s occupation is significantly associated with the outcome. This is because unemployment and low income deprives them of the means to provide quality foods to their family.

Various studies¹⁷⁻¹⁹ have shown that having a large family size can be a risk factor for severe under-nutrition. Our study showed that having siblings is in itself a risk factor for under-nutrition. Contrary to some African studies^{2, 20} that found a positive association between mothers’ education

and under-nutrition of their children, we were unable to appreciate this association as maternal literacy is over 80% in this population.

**Table 2: Risk factors for under-nutrition
N= 162**

| Factors | Cases N (%) (56) | Controls N (%) (106) | OR (95% CI) | Adjusted OR (95% CI) |
|---|------------------------|----------------------------|-------------------------|----------------------------|
| Low Birth Weight (LBW) | 14 (25) | 6 (5.7) | 5.55 (1.99-15.43)* | 3.66 (0.99, 13.53) |
| Illness in the last one month | 46 (82.1) | 44 (41.5) | 6.48 (2.95-14.21)* | 4.78 (1.83, 12.45)* |
| Birth Interval \leq 2 years | 25 (44.6) | 12 (16.9) | 3.96 (1.75-8.95)* | |
| Having more than one child | 42 (75) | 44 (41.5) | 4.22 (2.06-8.66)* | |
| Interaction of having > 2 children with birth interval \leq 2 years | 25 (44.6) | 12(11.3) | 6.31 (2.84, 14.05)* | 4.93 (1.78, 13.61) |
| Milk in the diet | | | | |
| Undiluted | 05(8.9) | 65(61.3) | 1 | 1 |
| Diluted | 48(85.7) | 36(33.9) | 17.33 (6.33, 47.45)* | 14.26 (4.65, 43.68)* |
| No | 03(5.3) | 05(4.7) | 7.80 (1.53, 17.97)* | 11.75 (1.80, 76.37) |

* Signifies P < 0.01

Our study showed a protective effect of breast feeding for more than one year [OR-0.938 (CI: 0.489-1.798)] which was, however, not significant. Studies^{9, 21} have shown that early cessation of breastfeeding is a risk factor for severe under-nutrition. However a study in Uganda¹⁰ showed that children who were breastfed for prolonged periods (>18 months and up to 24 months) had a greater incidence of stunting.

Feeding diluted milk to children, which is a norm in this region, was found to have significant association with undernourishment. This brings to light the importance of including undiluted wholesome milk in the diet of under-five children. Various types of food consumed by children such as local fast food including chips, mixture, cake, and



biscuits did not have any association with the presence of under nutrition.

This study showed an increased likelihood of recent infections (30 days preceding the interview) among those children with under-nutrition (Table 2). This is consistent with the findings of Kikafunda et al¹⁰ who showed high prevalence of current infection among those who were malnourished. The study suggested that the malnourished children had a higher incidence of infections due to poor immune factors as a result of inadequate nutrition. Similar findings were also observed by Shailen et al.²²

Association of low birth weight with under-nutrition is consistent with other studies which showed low birth weight to be a significant predictor of PEM.²³ The study by Odunaya et al¹³ showed that if the average interval between births is >3 years, the prevalence of undernourished children would be reduced. This has been reinforced in our study, which showed that if the birth interval was ≤2 years, there was a significant association with under-nutrition (Table 2). Inadequate birth spacing has been incriminated as a risk factor for malnutrition in several studies.^{2, 13, 17-19} In our study we observed that irrespective of birth spacing under-nutrition was more likely in those with siblings.

Immunisation is an essential intervention to prevent childhood infections and consequent under-nutrition. The unimmunised children in this study primarily belonged to the migrant population who form the lower socioeconomic strata of the society wherein lack of awareness and poverty is rampant.

We acknowledge the following limitations of our approach: Considering that the caregivers in the study were notably more literate as compared to a majority of rural population elsewhere, findings observed here may not be generalisable. There could have been many other environmental factors such as indoor air pollution, degree of overcrowding, among others, which could have an impact on the outcome, which was not specifically looked for. Owing to the small number of subjects in certain categories of the factors studied, a wider confidence interval was obtained for the risk estimates.

Conclusion

This study identifies low birth weight, interaction of short birth interval with more than two children in the family and illness in the past one month to be significant predictors of under-nutrition. A diet without milk or a diet with diluted milk was also found to be significantly associated with under-nutrition. This reiterates the need for appropriate

and locally feasible awareness campaigns that alleviate food fads and promote birth spacing.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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ETHICS COMMITTEE APPROVAL

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