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Impact of Pharmacist-Facilitated Education on Parental Awareness of Childhood Malnutrition: A Community-Based Interventional Study

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ABSTRACT:

Objective: To assess the nutritional status, based on physical measurements, of children in primary schools in an urban area of Karnataka, and to evaluate how a pharmacist-led educational intervention affects parents' knowledge, attitudes, and practices concerning childhood malnutrition.

Design: A community-based, cross-sectional intervention study in which parents' knowledge, attitudes, and practices (KAP) were evaluated before and after a structured educational session led by pharmacists. Three primary schools, School A, School B, and School C in an urban part of the Kalaburagi district, Karnataka, India, were observed over six months (March to August 2023), with approval from the Institutional Ethics Committee. A total of 336 children aged 5 to 10 years were enrolled for anthropometric evaluation; 221 of their parents (65.8%) also agreed to complete the KAP questionnaire and participate in the educational program.

Result: 83.6% of children were underweight, 53.9% exhibited wasting, and 13.4% showed stunting. The parental knowledge score increased markedly from 3.43±1.57 (49.0%) before the intervention to 5.83±0.89 (83.3%) after the intervention ($t=19.357$, $p<0.001$). Both attitude and practice scores showed significant improvement across all assessed statements ($p<0.001$).

Conclusion: Primary-school children showed a significant prevalence of undernutrition, coupled with low levels of parental awareness at the outset. A single, structured educational session led by a pharmacist resulted in a statistically significant improvement in parents' knowledge, attitudes, and behaviors, reinforcing the potential role of community pharmacists in preventing childhood nutrition issues.

KEYWORDS: *Anthropometry; Community Pharmacy Services; Health Knowledge, Attitudes, Practice; Health Education; Child Nutritional Physiological Phenomena; Malnutrition; Growth Disorders; Wasting Syndrome; Schools.*

I. INTRODUCTION

Malnutrition encompassing both undernutrition and overnutrition arises when nutrient intake, absorption or utilisation deviates from what a growing body needs. In children, it is tracked through simple anthropometric measures (height, weight, age) converted into WHO Z-scores, where a score between -2 and -3 standard deviations (SD) denotes moderate malnutrition, below -3 SD denotes severe malnutrition, and above +2 SD denotes overweight [1]. The World Health Organization frames undernutrition through three principal, overlapping presentations: stunting (low height-for-age, reflecting chronic deprivation), wasting (low weight-for-height, reflecting acute deprivation or illness), and underweight (low weight-for-age, which may reflect either or both processes), alongside micronutrient deficiency [1].

Malnutrition contributes directly or indirectly to more than 60% of the ten million child deaths recorded worldwide each year, and undernourished children carry a heightened risk of infection, delayed cognitive development, poorer scholastic performance and, for girls who later

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become mothers, lower-birth-weight offspring, perpetuating an intergenerational cycle of poor nutrition [2]. India's burden is disproportionately heavy: the country's prevalence of underweight children is among the highest in the world, and rural and semi-urban anthropometric surveys continue to document a substantial proportion of children falling below WHO reference standards [2,3]. Because clinical signs of mild-to-moderate malnutrition are subtle and easily missed, population-level anthropometric screening remains the most reliable and low-cost tool available to a community for early identification [3].

Parents and mothers in particular remain the practical gatekeepers of a child's daily diet. What food is made available, how meals are structured, and the emotional tone around eating are all shaped by parental knowledge, attitude and practice (KAP). A parent's own education level has repeatedly been shown to influence how effectively household resources are converted into child nutrition, independent of income [4], and nutritionally literate mothers have been shown to raise measurably healthier children [5]. Regional evidence from Karnataka similarly links parental socio-economic and educational status to a child's nutritional risk [6].

Despite this well-established link, structured, parent-directed educational interventions delivered specifically by pharmacists as opposed to physicians, nurses or dietitians remain scarce in the Indian literature, even though community pharmacists are among the most accessible primary-care contact points available to families. This study was therefore designed with two linked aims: first, to objectively determine the anthropometric nutritional status of children attending primary school in an urban Karnataka setting; and second, to assess whether a single, structured, pharmacist-facilitated educational session could measurably improve parental knowledge, attitude and practice regarding childhood malnutrition. The specific objectives were (i) to determine the nutritional status of children attending primary school, (ii) to identify factors influencing the nutritional status of this age group, and (iii) to improve parental knowledge regarding a healthy diet through structured education.

II. MATERIALS AND METHODS

Study design and setting: This was a community-based, cross-sectional interventional study conducted over a period of six months (March 2023 to August 2023) in three primary schools designated School A, School B and School C for the purpose of this report located in an urban area of Kalaburagi district, Karnataka, India.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of the authors' parent institution prior to commencement of data collection (Approval no:RME/COP/IRB006/PP/2022-23).Written informed consent was obtained from every participating parent, in English or the local language, prior to enrolment. As this was a non-pharmacological, educational-interventional study assessing knowledge, attitude and practice outcomes rather than a drug or device trial, registration with a clinical trial registry (e.g., CTRI) was not applicable.

Study population and sampling: Children in the 1st-5th standard (approximately 5-10 years of age) attending the three participating schools, together with their parents, were eligible for inclusion; parents unwilling to participate were excluded. A total of 336 children were enrolled for anthropometric assessment; of their families, 221 parents (65.8%) additionally consented to complete the KAP questionnaire and receive the educational intervention. All eligible, consenting children and parents across the three schools during the study period were included; no separate probability sampling frame was applied beyond whole-school enrolment.

Anthropometric assessment: Height and weight were measured for each child using a calibrated bathroom-type spring-balance scale (120 kg capacity), zeroed before each measurement; children were weighed without footwear, standing upright with the head held level. Weight-for-age and height-for-age were converted to WHO Z-scores. A child was classified as underweight or stunted when the respective Z-score was more than 2 SD below the WHO median for age and sex; overweight and obesity were defined as Z-scores of +2 SD and +3 SD, respectively.

KAP assessment and educational intervention: General demographic information (age, sex, parental education, occupation, family type, income and family size) and a self-structured, bilingual (English/Kannada) questionnaire covering knowledge, attitude and practice statements on childhood malnutrition were administered to consenting parents before (pre-test) and after (post-test) a standardised, structured educational session delivered by the study pharmacists, covering the

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causes, consequences and prevention of childhood malnutrition.

Statistical analysis: Data were entered in Microsoft Excel and analysed using IBM SPSS version 20.0. Quantitative variables were expressed as mean ± standard deviation and compared using paired and unpaired t-tests. Categorical variables were compared using the chi-square test (Yates-corrected where cell counts were small). A p-value <0.05 was considered statistically significant, and p<0.001 was labelled highly significant (HS).

Patient and public involvement: Patients and the public were not involved in the design, recruitment strategy, outcome selection, or conduct of this study. Parents and children participated as study subjects and, in the parental cohort, as recipients of the educational intervention, but were not involved in setting the research question, developing the questionnaire, interpreting the results, or shaping the dissemination plan. The findings will be shared with the participating schools and parents in a plain-language summary following publication.

III. RESULTS

Of the 336 children enrolled across the three schools, 53.0% attended School A, 24.4% School B and 22.6% School C. Boys (58.0%) slightly outnumbered girls (42.0%) in the overall sample; the mean age was 7.32 ± 1.72 years, with no statistically significant difference in age between genders (p=0.326). The demographic and physical characteristics of the children are summarised in Table 1.

On anthropometric assessment against WHO reference standards, a high burden of undernutrition was evident: 281 of 336 children (83.6%) were underweight, 181 (53.9%) were wasting, and 45 (13.4%) were stunted; only 5 children (1.5%) were overweight, and none met criteria for obesity in Table 2.

Of the 336 children screened, 221 parents (65.8%) consented to complete the KAP assessment and receive the pharmacist-facilitated educational intervention. The socio-demographic characteristics of this parental subgroup are summarised in Table 3: maternal education was concentrated at the secondary-school level (29.4%), with 8.1% of mothers illiterate; paternal education was concentrated at the PUC/Diploma level (33.0%), with 6.8% of fathers illiterate. More than half of mothers (54.3%) were housewives, while the largest single occupational category among fathers (40.3%) was salaried employment. The largest monthly-family-income band was ₹11,000–20,000 (36.2%).

Parental knowledge of childhood malnutrition improved markedly following the educational intervention. In the pre-test, 48.9% of parents scored poor (<50%), 43.9% scored moderately good (50–75%), and only 7.2% scored good (75–100%); the mean pre-test score was 3.43 ± 1.57 (49.0%). Post-intervention, the proportion scoring good rose to 61.5%, while poor scores fell to just 0.5%; the mean post-test score rose to 5.83 ± 0.89 (83.3%), a highly significant improvement of 41.5 percentage points (paired t=19.357, p<0.001) (Table 4).

Parental attitude and practice regarding childhood malnutrition also improved significantly across every statement assessed (Table 5). Notably, the proportion of parents who believed a nutritious diet was inherently costly fell from 55.7% pre-test to 36.2% post-test (χ^2=6.269, p=0.010), while agreement that a healthy childhood prevents disease later in life rose from 46.6% to 71.0% (χ^2=7.103, p=0.007). On the practice front, daily feeding of fresh fruit and vegetables rose from 47.1% to 85.5% (χ^2=15.029, p<0.001), daily milk/milk-product consumption rose from 28.5% to 86.0% (χ^2=41.944, p<0.001), and daily breakfast consumption rose from 39.8% to 96.4% (χ^2=31.780, p<0.001).

Across all three domains assessed – knowledge, attitude and practice – the pharmacist-facilitated educational intervention produced a statistically highly significant improvement (p<0.001 for every domain-level comparison).

IV. DISCUSSION

To our knowledge, this is among the earliest studies in this region to integrate objective anthropometric screening of primary-school children with a structured, pharmacist-led parental education program on malnutrition, rather than the physician or nurse-driven approaches more frequently reported in the literature.

Nutritionally, the anthropometric burden documented here 83.6% underweight, 53.9% wasted, and 13.4% stunted is more severe than that reported in several similar Indian populations. A survey of primary-school children in rural Karnataka found that 40.5% exhibited either thinness or severe thinness [7], whereas an urban Karnataka group of Anganwadi children showed underweight, stunting, and wasting rates of 34.1%, 45.5%, and 35.5% respectively [8] lower in underweight and wasting

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but higher in stunting compared to the current sample, highlighting how local catchment areas, socioeconomic diversity, and age distribution can alter the prevalence of chronic malnutrition conditions. In international studies, a cohort of children from southwestern Nigeria, applying the same WHO Z-score standards, found stunting and underweight prevalence rates of 65.7% and 74.5%, respectively [9]. These figures are generally similar to those reported here, showing that undernutrition in school-age children continues to be a major public health challenge in low- and middle-income settings.

Regarding parental knowledge, attitude and practice, pre-test data revealed that fewer than one in ten parents (7.2%) had good baseline knowledge of childhood malnutrition, a pattern consistent with an earlier finding that 80% of mothers of under-five children in a north-Indian urban cohort had inadequate knowledge of protein-energy malnutrition [10], and with a Bangladeshi study reporting that more than half of adolescent schoolgirls' mothers lacked good knowledge of a balanced diet [11]. The concentration of secondary-level maternal education and PUC-level paternal education observed in our sample mirrors the education profile reported among Anganwadi mothers in a north-Indian district, where nutrition-education level directly shaped what children were fed [12], and is consistent with a South-Asian demographic-survey analysis showing that parental education and household economic rank significantly influence underweight and stunting risk [13]. This pattern of a direct relationship between parental nutrition-related knowledge and child feeding practice has also been documented among mothers of pre-school and under-five children in other Indian cohorts [14,15,16].

Implications for research and practice: These results show that community pharmacists can function as accessible, reasonably priced educators in preventive child nutrition programs and that even a single structured educational encounter can result in noticeable, immediate improvements in parental knowledge, attitudes, and behaviors. To determine whether these advantages endure and result in improved child growth metrics, future research should concentrate on larger, controlled, multi-center trials with longer follow-up periods.

Limitations: It is important to acknowledge a number of limitations. The KAP subsample (221 of 336 families) was smaller than the anthropometric sample because not all parents agreed to participate, and self-reported responses cannot be independently verified for veracity. The self-designed questionnaire's limited number of items prevented it from covering every facet of parental knowledge, attitudes, and behaviors. Finally, the study cannot conclusively link the observed changes to the educational intervention alone because it used a single-arm, pre-post design without a concurrent control group. Nevertheless, the consistent and significant improvements across all three domains support the findings.

V. CONCLUSION

This study demonstrates a substantial burden of undernutrition among primary-school children in an urban Karnataka setting, with underweight, wasting, and stunting prevalences of 83.6%, 53.9%, and 13.4%, respectively. It also reveals a notably low baseline parental awareness of childhood malnutrition. Parental knowledge, attitude, and practice improved statistically significantly ($p<0.001$ across all domains) after a single planned educational session led by a pharmacist, including a decline in the myth that eating healthily is too costly. To confirm whether these short-term gains in parental awareness translate into long-term improvements in children's anthropometric outcomes, these findings support the need for larger, controlled, multicentric studies. Additionally, they encourage community pharmacists to play a useful, scalable role in preventive child nutrition programs as accessible educators.

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Conflict of Interest: None declared.

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Tables and Figures

Table 1. Demographic and physical characteristics of children (N=336)

Characteristic	Category	n	%
Age (years)	5.0–7.0	170	50.6
	7.1–9.0	91	27.1
	9.1–11.0	75	22.3
Sex	Male	195	58
	Female	141	42
Height (cm)	80.0–100.0	54	16.1
	100.1–120.0	160	47.6
	120.1–140.0	116	34.5
	>140.0	6	1.8
Weight (kg)	10–20	234	69.6
	21–30	85	25.3
	31–40	15	4.5
	>40	2	0.6

Mean ± SD age: 7.32 ± 1.72 years (boys 7.24 ± 1.67; girls 7.43 ± 1.78; t=0.984, p=0.326, not significant). Mean ± SD height: 115.15 ± 13.25 cm. Mean ± SD weight: 19.25 ± 5.83 kg.

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Table 2. Nutritional status of children based on WHO anthropometric indicators (N=336)

Indicator	Category	n	%
BMI classification	Underweight (<18.5 kg/m²)	281	83.6
	Normal (18.5–24.9 kg/m²)	50	14.9
	Overweight (25.0–29.9 kg/m²)	5	1.5
	Obesity (30.0–34.9 kg/m²)	0	0
Stunting (low height-for-age)	Present	45	13.4
Wasting (low weight-for-height)	Present	181	53.9
Underweight (low weight-for-age)	Present	281	83.6
Overweight (Z-score +2 SD)	Present	5	1.5

Table 3. Socio-demographic characteristics of participating parents (N=221)

Characteristic	Category	n	%
Maternal education	Illiterate	18	8.1
	Secondary education	65	29.4
	PUC/Diploma	59	26.7
	Degree and above	59	26.7
Paternal education	Illiterate	15	6.8
	Secondary education	48	21.7
	PUC/Diploma	73	33
	Degree and above	70	31.7
Maternal occupation	Housewife	120	54.3
	Employed (skilled/salaried/business)	101	45.7
Paternal occupation	Salaried employee	89	40.3
	Farmer/skilled/business/other	132	59.7
Monthly family income (₹)	≤10,000	23	10.4
	11,000–20,000	80	36.2
	21,000–30,000	52	23.5
	31,000–50,000	42	19
	>50,000	24	10.9

Table 4. Comparison of parental knowledge scores on childhood malnutrition – pre-test vs post-test (N=221)

Score category	Pre-test n (%)	Post-test n (%)
Poor (<50%)	108 (48.9)	1 (0.5)
Moderately good (50–75%)	97 (43.9)	84 (38.0)
Good (75–100%)	16 (7.2)	136 (61.5)
Total	221 (100.0)	221 (100.0)
Mean ± SD	3.43 ± 1.57 (49.0%)	5.83 ± 0.89 (83.3%)
Paired t-test	t = 19.357, p = 0.0001, HS	

Table 5. Comparison of parental attitude and practice regarding childhood malnutrition – pre-test vs post-test (N=221)

Statement	Pre-test n (%)	Post-test n (%)	χ^2 test, p-value
A healthy childhood prevents disease later in life (attitude)	103 (46.6)	157 (71.0)	χ^2=7.103, p=0.007, HS
Watching TV/mobile while eating is acceptable (attitude)	51 (23.1)	25 (11.3)	χ^2=7.60, p=0.005, HS
An unhealthy diet damages the child's health (attitude)	107 (48.4)	194 (87.8)	χ^2=15.167, p=0.000, HS
Iodine-rich salt promotes healthy growth (attitude)	82 (37.1)	156 (70.6)	χ^2=15.134, p=0.000, HS

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A healthy diet for the child is costly (attitude)	123 (55.7)	80 (36.2)	χ^2=6.269, p=0.010, HS
Feeds fresh fruits and vegetables daily (practice)	104 (47.1)	189 (85.5)	χ^2=15.029, p=0.000, HS
Child consumes milk/milk products daily (practice)	63 (28.5)	190 (86.0)	χ^2=41.944, p=0.000, HS
Child consumes breakfast daily (practice)	88 (39.8)	213 (96.4)	χ^2=31.780, p=0.000, HS
Child participates in physical activity regularly (practice)	78 (35.3)	180 (81.4)	χ^2=26.015, p=0.000, HS