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GROWTH STATUS, FEEDING PRACTICES AND ENVIRONMENTAL RISK FACTORS AMONG CHILDREN UNDER FIVE YEARS IN DISTRICT SWABI, KHYBER PAKHTUNKHWA, PAKISTAN: A CROSS-SECTIONAL STUDY

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Abstract

Background: *Child undernutrition remains a major public health problem in Pakistan, and local data from District Swabi, Khyber Pakhtunkhwa, are limited. Nationally, about 40% of children under five years are stunted and nearly 18% are wasted, and feeding practices, recurrent infection, poor sanitation and household poverty are closely interrelated determinants. Nurses deliver growth monitoring and feeding counselling at primary care level, yet the nutritional and environmental profile of children attending health facilities in this district has not been well described.*

Objective: *To describe growth status, infant feeding practices, recent morbidity and water, sanitation and hygiene (WASH) conditions among children under five years, and to test whether weight and height categories differ by sex.*

Methods: *A facility-based descriptive cross-sectional study was conducted in June 2026 using consecutive sampling at public health facilities in District Swabi. Mothers or caregivers completed an interviewer-administered questionnaire and children were weighed and measured. Weight and height were recoded into three ordinal categories, and sex differences were tested with Pearson's chi-square test.*

Results: *Of 400 mother–child pairs surveyed, 398 had valid data on sex (77.6% male); 77.5% lived in rural areas and 74.9% of fathers were unemployed. Mean weight was 11.23 ± 3.84 kg and mean length/height 76.92 ± 11.53 cm. Most mothers initiated breastfeeding within one hour (82.1%) and reported exclusive breastfeeding for six months (81.0%), yet 68.4% gave pre-lacteal feeds. In the previous two weeks, 65.3% of children had diarrhoea and 68.5% had fever; 29.1% of households used unprotected drinking water and 66.7% disposed of waste in open fields. Weight ($\chi^2(2) = 0.04$, $p = 0.982$) and height categories ($\chi^2(2) = 0.97$, $p = 0.614$) did not differ by sex.*

Conclusion: *Growth categories did not differ by sex in this facility-based sample, while morbidity, environmental and economic vulnerability were common. These exposures were not tested against growth outcomes, so causal conclusions cannot be drawn. Lactation counselling, WASH improvement and WHO z-score–based analyses with multivariable modelling are recommended.*

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INTRODUCTION

Malnutrition, in the forms of stunting, wasting, underweight and overweight, remains one of the most important threats to the survival and development of children under five years. Global estimates cited for 2020 include about 144 million stunted and 47 million wasted children, and undernutrition has been linked to roughly 45% of deaths in this age group [1]. Malnutrition is also associated with child mortality [2], the double burden of undernutrition and overweight is increasingly recognised [3,4], and climate change and food systems add further pressure on child nutrition [5].

Pakistan is among the countries with the highest burden: 40.2% of under-five children are stunted, 28.9% underweight and 17.7% wasted, with similar figures reported for Khyber Pakhtunkhwa (40%, 23.1% and 15%, respectively) [6]. Community and facility studies in the province show high levels of undernutrition: in Tehsil Battagram, 49.2% of children aged 6–59 months were stunted, 33.1% underweight and 18.7% wasted [6], and in District Peshawar 20% of children aged 3–5 years had low weight-for-height and 28% had low mid-upper arm circumference [7]. Prevalence and determinants of malnutrition have also been examined in Batkhela [8], Peshawar [9] and Gwadar [10].

Reported determinants are multifactorial. In a Karachi squatter settlement, low household income (aOR 7.13), low paternal education (aOR 4.86), pour-flush/pit latrines (aOR 4.41) and exclusive breastfeeding for less than six months (aOR 3.58) were associated with malnutrition [11]. In Battagram, higher income and exclusive breastfeeding were protective, whereas lack of a latrine, no antenatal care and incomplete immunisation increased the odds of undernutrition [6]. Studies in Peshawar, Lebanon and Ecuador similarly point to frequent infections, feeding patterns, low dietary diversity, household crowding and limited paternal financial support [7,12,13]. Studies from Bangladesh [14], India [15], South Sudan [16] and sub-Saharan Africa [17] have also examined the prevalence and determinants of child malnutrition, including geospatial and environmental determinants of stunting, wasting and underweight in rural South and Southeast Asia [18].

Prevention and management strategies for malnutrition in children under five years have been described [19,20]. Nurses deliver growth monitoring, immunisation and feeding counselling at primary care level, yet data describing the nutritional and environmental profile of children attending facilities in District Swabi are limited. This study therefore aimed to (i) describe the growth status, infant feeding practices, recent morbidity and WASH conditions of children under five years in District Swabi, and (ii) examine whether weight and height categories differ by child sex.

Methods

Study design and setting

A descriptive, facility-based cross-sectional study was conducted in District Swabi (Mardan Division, Khyber Pakhtunkhwa), which comprises four tehsils (Swabi, Lahor, Razzar and Topi). Data were collected at public health facilities offering immunisation, growth monitoring and general paediatric care: a tertiary teaching hospital (Bacha Khan Medical Complex), the District Headquarters Hospital, two Rural Health Centres and five Basic Health Units acilities were purposively selected to cover all four tehsils.

Participants and sampling

Children aged 0–59 months residing in District Swabi were eligible if their mother or caregiver gave consent; children too ill to be measured, or with conditions preventing accurate measurement, were excluded. Within each facility, eligible children presenting during the data collection period were recruited consecutively until the facility quota (about 51 children) was reached. The youngest child enrolled was 6 months old.

Sample size

The sample size was calculated with Cochran's formula for finite populations, assuming a population of 10,000, 95% confidence, expected prevalence of 45% and a 5% margin of error, giving 367 children. Allowing for about 10% non-response, the target was set at 400.

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Data collection

Data were collected over four weeks in June 2026 after institutional ethical approval. A semi-structured questionnaire adapted from WHO and UNICEF instruments covered (A) socio-demographic and economic characteristics, (B) child health, dietary, WASH and health-care utilisation indicators, and (C) anthropometry. The tool was piloted on 10% of the projected sample in a neighbouring community (excluded from analysis); Cronbach's alpha was 0.92. Student researchers, assisted by Lady Health Workers who completed a two-day training on consent, interviewing and measurement, interviewed mothers or caregivers and measured the children. Age was verified from the birth certificate, EPI vaccination card or NADRA B-Form.

Children were weighed using a calibrated electronic scale (calibrated against a 5 kg standard; tared weighing for infants). Length was measured with an infantometer in children under two years (or < 85 cm) and height with a stadiometer in older children. Mid-upper arm circumference was also recorded but is not analysed in this report. Weight and height were recoded into three ordinal categories (low, moderate, high weight; short, moderate, tall) using cut-points derived from the sample distribution. These are sample-relative categories and not WHO z-score indicators.

Data management and analysis

Data were double-entered, checked for out-of-range values and missing data, and analysed in IBM SPSS Statistics (version 21). Categorical variables are presented as frequencies and percentages of valid responses (cases with missing values were excluded for that variable), and continuous variables as mean ± standard deviation. Pearson's chi-square test of independence was used to compare weight and height categories by sex, with a two-sided significance level of 0.05.

Ethical considerations

The study was approved by the Institutional Review Board of the Hamdan Institute of Nursing and Allied Health Sciences, Swabi (approval no. HINAHS/Admin/026/05/7216-IRB). Written informed consent was obtained in Urdu, Pashto or English; for illiterate participants the form was read aloud before a witness and a thumb impression was taken. Questionnaires carried only identification numbers. Children found to have severe malnutrition were referred to appropriate services, and participants received nutrition education pamphlets. No incentives were provided.

Results

Participant characteristics

Of 400 mother–child pairs surveyed, 398 had valid data on sex: 77.6% (n = 309) were boys and 22.4% (n = 89) girls. Children were aged 6–59 months (mean 23.2 ± 14.8 months), and 79.0% were under 36 months (Figure 1A). Most mothers were literate (73.8%), most fathers were unemployed (74.9%), 77.5% of families lived in rural areas and 29.4% had more than five children (Figure 1B).

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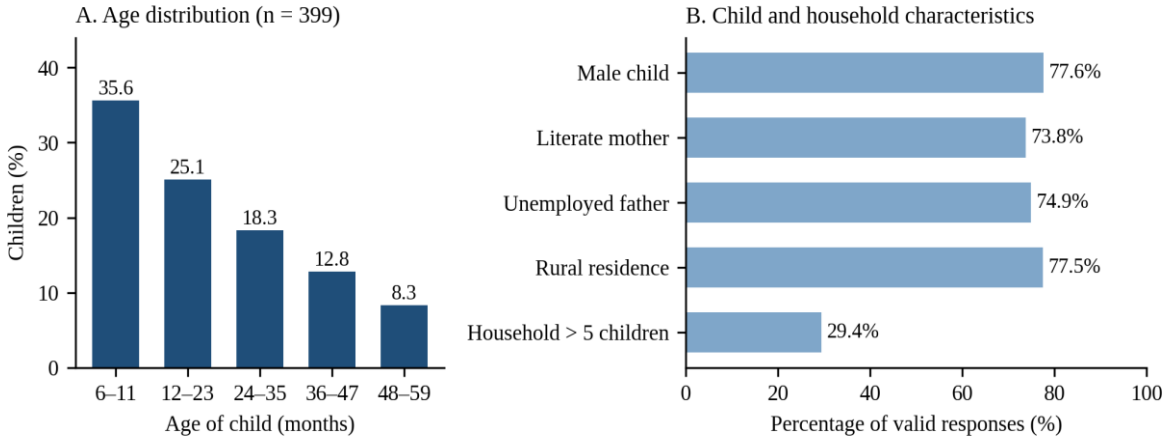


Figure 1. Characteristics of the children and households. (A) Age distribution of children; (B) child and household characteristics (percentages of valid responses, n = 391–399 per variable).

Anthropometric characteristics

Mean weight was 11.23 ± 3.84 kg (range 4.50–19.70 kg) and mean length/height was 76.92 ± 11.53 cm (range 56.20–105.80 cm) (Figure 2). The wide ranges reflect the broad age span (6–59 months) of the sample.

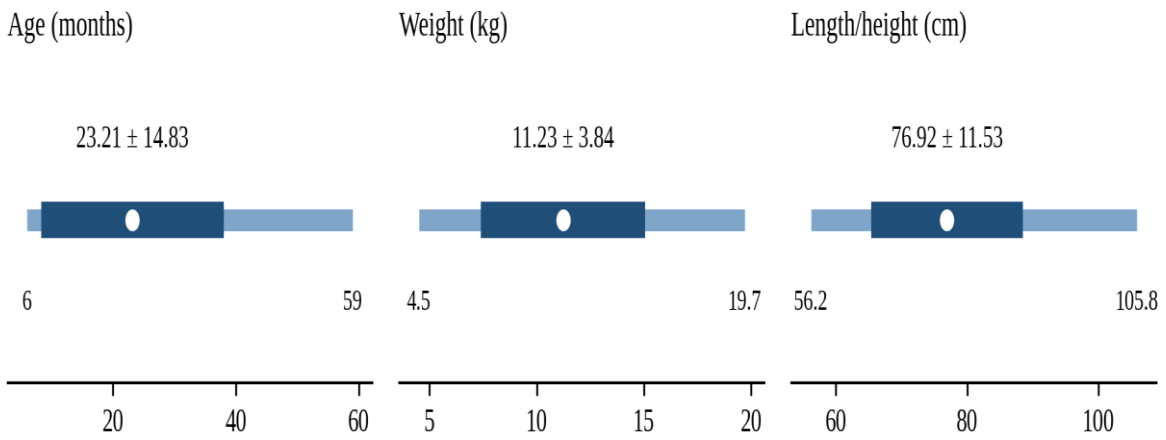


Figure 2. Age, weight and length/height of the children (dark bar: mean ± SD; light bar: minimum–maximum).

Infant feeding practices

Breastfeeding was initiated within the first hour for 82.1% of children, 81.0% were reported as exclusively breastfed for six months and 78.8% started complementary feeding at six months. However, 68.4% had been given pre-lacteal feeds, most commonly animal milk (56.7%), followed by butter (25.4%) and plain water (16.0%) (Figure 3).

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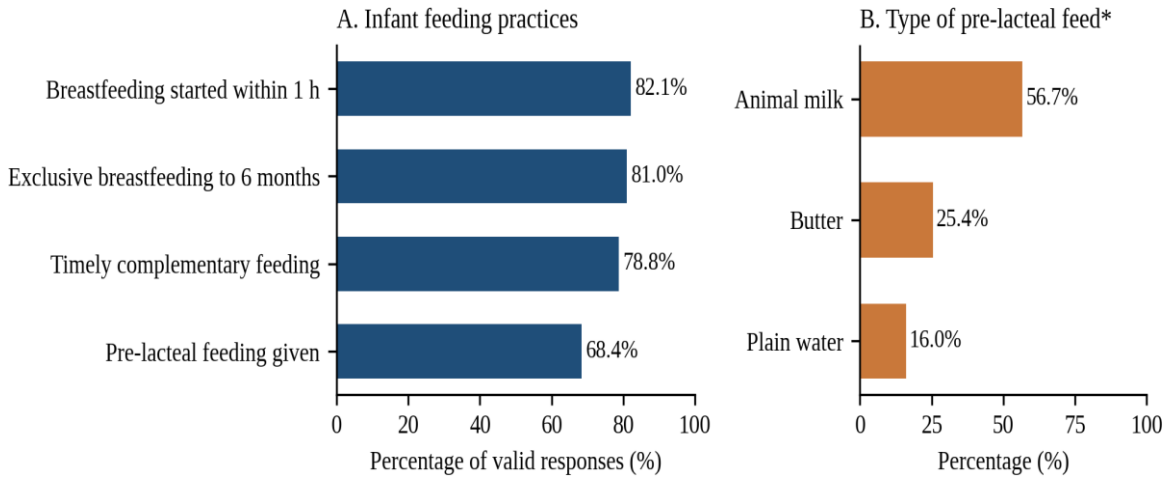


Figure 3. Infant feeding practices (A) and types of pre-lacteal feed (B). *The counts reported for the three feed types (212, 95 and 60) exceed the 270 children given pre-lacteal feeds, which suggests multiple responses.

Morbidity and WASH conditions

In the two weeks before the survey, 65.3% of children had diarrhoea and 68.5% had fever (Figure 4A). Although 80.8% of mothers reported handwashing before preparing meals and 82.4% after using the toilet, 29.1% of households relied on unprotected drinking water and 66.7% disposed of solid waste in open fields (Figure 4B).

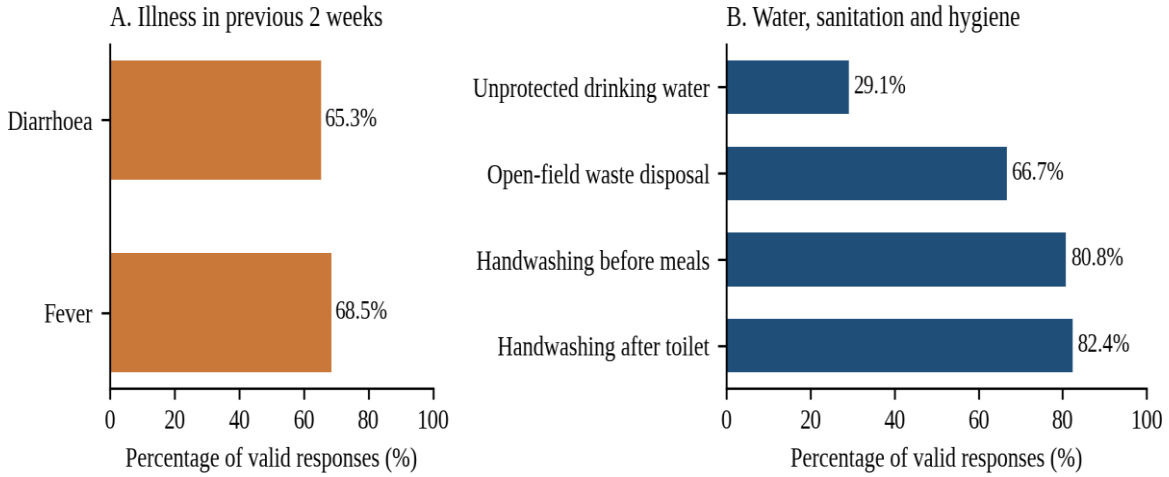


Figure 4. Illness in the previous two weeks (A) and water, sanitation and hygiene indicators (B).

Weight and height by sex

The proportion of children in the low-weight category was similar in boys and girls (23.3% vs 22.5%), and the distributions did not differ ($\chi^2(2) = 0.04$, $p = 0.982$). Short stature was more frequent in boys than girls (30.7% vs 25.8%), but this difference was not statistically significant ($\chi^2(2) = 0.97$, $p = 0.614$) (Figure 5). All expected cell counts exceeded 5.

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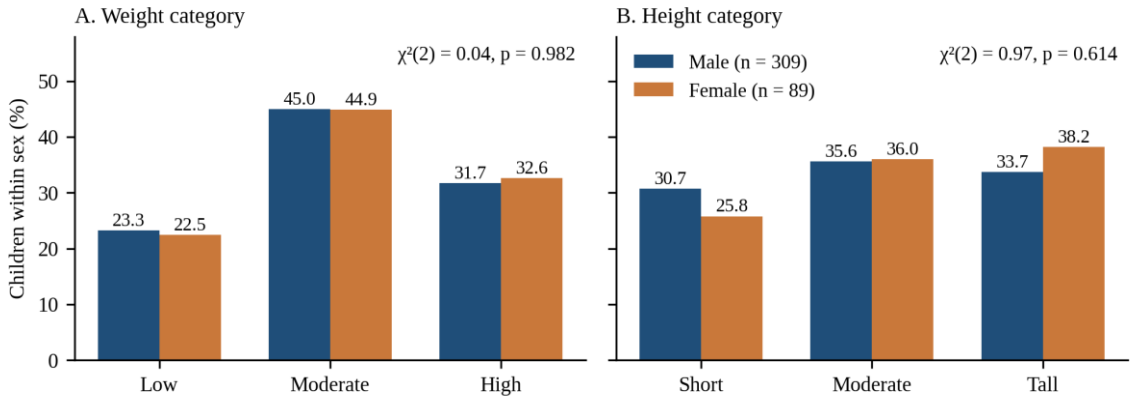


Figure 5. Weight (A) and height (B) categories by sex (percentage within sex; Pearson's chi-square test, n = 398).

Discussion

In this facility-based sample of children under five in District Swabi, weight and height categories did not differ by sex, while recent diarrhoea and fever, unprotected water, open-field waste disposal, pre-lacteal feeding and paternal unemployment were all common. These findings describe the circumstances in which children presented for care; the study was not designed to estimate the prevalence of stunting, wasting or underweight, and the exposures were not analysed against growth outcomes.

The absence of sex differences should be interpreted cautiously. Boys made up 77.6% of the sample, a marked imbalance that may reflect sex-differential health-care seeking or access, so the sample may not represent girls in the community. In addition, the weight and height categories are relative to the sample distribution, so the test compares distributions rather than the risk of clinical undernutrition, and they cannot capture the double burden of undernutrition and overweight described elsewhere [3,4].

Infant feeding showed a notable contrast. Early initiation, exclusive breastfeeding and timely complementary feeding were each reported by about four-fifths of mothers, yet more than two-thirds gave pre-lacteal feeds. Feeding practices have been linked to malnutrition elsewhere: shorter exclusive breastfeeding and inappropriate weaning age were associated with malnutrition in Karachi [11], and feeding patterns and dietary diversity were important in Lebanon [12]. Pre-lacteal feeds delay the establishment of exclusive breastfeeding and expose infants to possible contamination, and the high reported rate of exclusive breastfeeding alongside pre-lacteal use may partly reflect differences in how the practices were defined or social-desirability bias.

The infection burden was high, with about two-thirds of children affected by diarrhoea or fever in a two-week period, in a setting where nearly one-third of households used unprotected water and two-thirds disposed of waste in open fields. Mothers' reported handwashing was high, which suggests that household hygiene behaviour alone may not offset a contaminated environment, although handwashing was self-reported. Studies from Khyber Pakhtunkhwa and Karachi have linked lack of a latrine or pit latrines [6,11], frequent infections [7] and crowding [13] with undernutrition, but the present data cannot test these pathways. Environmental determinants of stunting, wasting and underweight have also been described in rural South and Southeast Asia [18], and climate-related pressures on food systems may add to this vulnerability [5].

Economic vulnerability was also marked: 74.9% of fathers were reported as unemployed, which may include daily-wage or informal work depending on how employment was recorded. Low income and low paternal education were strongly associated with malnutrition in Karachi [11], and higher income was protective in Battagram [6] and Peshawar [7]. Whether these factors operate similarly in Swabi requires multivariable analysis.

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Implications for practice.
Nurses can use immunisation and growth-monitoring visits to counsel mothers against pre-lacteal feeding and on complementary feeding, screen for diarrhoea and refer children with severe malnutrition. Our findings also support collaboration with district authorities and Lady Health Workers on safe water and sanitation, and linking vulnerable households to available social protection schemes.
Recommendations. (1) Integrate counselling on exclusive breastfeeding and the avoidance of pre-lacteal feeds into routine immunisation and growth-monitoring visits. (2) Strengthen community-level WASH measures, including protected water sources and safe waste disposal, in partnership with district authorities. (3) Re-analyse the dataset using WHO *z*-scores (height-for-age, weight-for-height and weight-for-age) and multivariable models to estimate undernutrition prevalence and its determinants. (4) Use community-based sampling in future work to reduce the male predominance seen in this facility-based sample.
Strengths and limitations. Strengths include measured (rather than reported) anthropometry, trained data collectors, age verification from official records, a piloted questionnaire and a sample close to the calculated size. Limitations are the cross-sectional design; facility-based convenience sampling with a marked male predominance, which limits generalisability; sample-derived rather than WHO *z*-score growth categories; chi-square testing limited to sex, with no adjustment for confounders; and reliance on maternal recall and self-reported hygiene.

Conclusion

Among children attending public facilities in District Swabi, weight and height categories did not differ by sex. High recent morbidity, unsafe water and waste disposal, pre-lacteal feeding and widespread paternal unemployment indicate a vulnerable setting. Studies using WHO *z*-scores and multivariable analysis are needed to quantify undernutrition and identify its determinants; meanwhile, lactation counselling and WASH improvement should be prioritised.
Abbreviations: aOR, adjusted odds ratio; BHU, Basic Health Unit; DHQ, District Headquarters; EPI, Expanded Programme on Immunisation; MUAC, mid-upper arm circumference; RHC, Rural Health Centre; SD, standard deviation; UNICEF, United Nations Children's Fund; WASH, water, sanitation and hygiene; WHO, World Health Organization.

Declarations

Ethics approval and consent to participate: The study was approved by the Institutional Review Board of the Hamdan Institute of Nursing and Allied Health Sciences, Swabi (HINAHS/Admin/026/05/7216-IRB).
Written informed consent was obtained from all mothers and caregivers. The study was conducted in accordance with the Declaration of Helsinki.
Availability of data and materials: The dataset analysed during the current study is available from the corresponding author on reasonable request.
Competing interests: The authors declare that they have no competing interests.
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Authors' contributions: SR: conceptualisation, methodology, formatting; NK: formatting, data collection, data analysis; MK: data collection, data analysis, results; AA: data collection, data analysis, results; AB: data collection, data analysis, results; JK: data collection, data analysis, results; BK: data collection; SS: data collection.
All authors read and approved the final manuscript.

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