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FOOD SECURITY, DIETARY QUALITY AND GROWTH OUTCOMES AMONG SCHOOL CHILDREN IN EHLANZENI DISTRICT, SOUTH AFRICA

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ABSTRACT

Household food insecurity and poor diet quality pose significant threats to children's growth and academic performance. Poverty remains a major issue in the Ehlanzeni District of South Africa, with a significant share of the population experiencing socio-economic difficulties. This study assessed food security status, dietary quality and growth outcomes among primary school children. Random sampling was used to select 330 children, aged 11 to 15 years and in Grade 7, from five randomly selected primary schools. Weight (kg) and height (m) were measured using standard techniques. A 24-hour dietary recall was used to capture the dietary diversity of the household. Dietary intake was calculated using the Food Frequency Questionnaire. The prevalence of underweight, overweight, and obese was 4%, 28% and 13 % respectively. The findings of the study revealed that 21.8% of the households were food insecure while 43,9% were food insecure moderately and 28.6% were mildly food insecure as per HFIAS categories and only 5.7% of household experienced severe food insecurity during the time of the study. Household income positively correlated with dietary diversity ($r = 0.264$; $p = 0.013$), dietary iron ($r = 0.133$; $p = 0.015$) and vitamin A ($r = -0.134$; $p = 0.001$). Underweight positively correlated with dietary zinc ($r = 0.172$; $p = 0.008$), calcium ($r = 0.146$; $p = 0.008$) and negatively correlated with dietary carbohydrates ($r = -0.144$; $p=0.009$). Dietary diversity positively correlated with dietary zinc ($r = 0.167$; $p = 0.002$) and vitamin A ($r=0.492$; $p=0.001$). Many families, despite having moderate incomes, spend less on food, resulting in poor nutrition. Overweight and obesity were more prevalent than underweight, with notable differences between boys and girls. Food insecurity further restricted children's access to essential nutrients, while unemployment and limited food budgets exacerbated the problem. To address these issues, policies should prioritize improving food access, creating job opportunities, and promoting nutrition education. Additionally, school feeding programs and financial support can play a crucial role in enhancing children's health and well-being.

Key words: Food insecurity, dietary intake, anthropometric status, children, primary schools

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INTRODUCTION

South Africa faces numerous challenges, including high unemployment, poverty, an ongoing energy crisis, and rising living costs. These factors adversely affect food security, making food expensive and inaccessible for many, thereby increasing the number of individuals and households experiencing food inadequacy and hunger [1]. While the country may be food secure at a national level, many households remain food insecure, with a significant portion of the population living below the poverty line [2]. Despite the government's commitment to halving poverty between 2004 and 2014, household food insecurity remains a serious concern. In 2017, Statistics South Africa reported that 56% of the population lived in poverty, with nearly 28% experiencing extreme poverty, below the food poverty line [3]. Additionally, in 2014, Stats SA estimated that about 20% of South African households had inadequate or severely inadequate access to food [4].

In 2014, Shisana *et al.* [5] reported that 32.8% of rural households and 32.4% of informal urban households faced food insecurity, compared to just 19% of households in formal urban areas. This indicates that two out of three people in rural and informal urban areas are either experiencing food insecurity or are at imminent risk. Due to limited opportunities for cultivating their own food, many individuals rely on purchased food. The amount of money available for food and current food prices are the primary determinants of food security [6]. Food insecurity continues to be a significant issue in South Africa's rural communities [7, 8]. In line with Sustainable Development Goal (SDG) 2, the South African government's National Development Plan (NDP) aims to eradicate rural food insecurity by 2030. Food insecurity can reduce the quality, variety, and desirability of diets, disrupt eating patterns, and lower food intake [9]. Long-term food deprivation has detrimental effects on children's physical development, as well as their academic and cognitive performance [10].

In South Africa, feeding practices for children often vary according to gender, with cultural, socio-economic, and nutritional factors influencing dietary patterns. Gendered differences in food allocation and nutrition are particularly evident in certain communities, where boys and girls may receive different types and quantities of food [11]. Research has shown that boys are sometimes given larger portions of food or more nutrient-dense meals compared to girls, who may face dietary restrictions due to cultural norms or resource constraints within households [12,13]. These disparities can have significant implications for the health, growth, and development of children, particularly in low-income or food-insecure areas. Understanding these gendered feeding practices is crucial to addressing nutritional inequalities and improving the overall well-being of children in South Africa.

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Ehlanzeni District was selected for this study because, in 2018, it had the highest proportion (46%) of individuals living with low poverty compared to other districts (Gert Sibande and Nkangala) in Mpumalanga province. In 2019, approximately 1.26 million people were living in poverty, as defined by the upper poverty line, across the Ehlanzeni District Municipality. The Ehlanzeni District Municipality Draft IDP and Budget Review [14] Ehlanzeni District Municipality Draft IDP and Budget Review 2019/2020] reported a decrease in the percentage of people living in poverty, from 72.79% in 2009 to 67.79% in 2019, this figure remains alarmingly high. While numerous studies have explored food insecurity in other districts within Mpumalanga Province, there is limited data on the prevalence of food insecurity and dietary intake, particularly among rural primary schoolchildren in Ehlanzeni District, South Africa. The current study is grounded in the 1990 UNICEF Conceptual Framework [15], which delineates the basic, underlying, and immediate causes of malnutrition across all age groups. This framework acknowledges that malnutrition encompasses both undernutrition and overnutrition, including conditions such as overweight and obesity.

The prevalence of poverty in the Ehlanzeni District of South Africa remains a significant challenge, with a large portion of the population facing socio-economic hardships. Ehlanzeni, located in the Mpumalanga province, is one of the areas in South Africa where poverty rates are notably high, especially in rural and peri-urban communities (IDP And Budget Review 2019/2020). According to various reports, including those from Statistics South Africa, a considerable proportion of the district's population lives below the poverty line, experiencing limited access to basic services like education, healthcare, clean water, and proper sanitation (IDP And Budget Review 2019/2020). In addition to high unemployment rates, factors such as limited economic opportunities and an over-reliance on subsistence farming contribute to the region's ongoing poverty challenges. The prevalence of poverty in this district may significantly affects the health, education, and overall well-being of its residents, particularly children. This leads to long-term developmental challenges, perpetuating cycles of poverty in the district. The study aims to assess the food security, dietary quality and growth outcomes among school children, Ehlanzeni District, South Africa

METHODS

Study design and setting

A cross-sectional study was conducted to investigate the food security status, dietary intake and anthropometric status of children attending primary schooling in Ehlanzeni District. The research was conducted in the Mangweni village in Ehlanzeni District, one of the three municipal districts of Mpumalanga province. It

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was selected because in 2018, the district had the highest (46%) people with low bund poverty than the two districts. A list of primary schools in Mangweni village was provided by the circuit office. Data were collected by the researcher (Qualified nutritionist) and research assistants (student from Biokinetics and Nutrition) between March and June 2021. Research assistants were trained on procedures and methods of data collection 2 weeks before data collection started by the researcher and supervisor. The appointment of the fieldworkers was based on their qualifications, which were needed for both the study and competent general practice.

Study population, Sample size and sampling procedure
Simple random sampling was employed to select both primary schools and child participants for the study. Each learner aged 11 to 15 years, and each primary school was assigned a unique number, which was then placed into a bowl for random selection. The researcher, blindfolded, picked numbers one at a time until a total of 330 participants was reached. Only children whose parents or caregivers provided consent and who were present on the day of data collection were included in the study. Ethically approved assent forms were distributed for children to sign if their parents had consented to their participation.

Children with physical disabilities that would hinder anthropometric measurements were excluded from the study due to the lack of appropriate equipment for measuring height in individuals with disabilities. Mangweni village has five primary schools, with a total enrolment of 1,883 learners.

The sample size was calculated using Slovin's formula: $n = N/ (1 + Ne^2)$ [16], where N represents the population size of 1,883 learners. A margin of error of 0.05 was deemed acceptable, and a 95% confidence level was chosen. The application of this formula yielded a sample size of 300 subjects. To account for potential attrition, an additional 10% was added, resulting in a final total of 330 learners selected to participate in the study, all of whom had received consent from their parents or caregivers.

Data collection and variables measured
A separate classroom at each primary school was used to do data collection. This was to ensure privacy and a safe environment for the children and parents/caregivers. Two working stations were arranged within the classroom. A questionnaire was used to collect data. Variables measured included socio-demographic characteristics, anthropometric measurements (height and weight), dietary intakes and food security.

Socio-demographic characteristics

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The socio-demographic characteristics were assessed using a questionnaire administered orally to children and parents/caregivers. The socio-demographic characteristics measured were age, educational level and child grant, parents' employment status, type of employment, household income, money spent on food, other types of grants in the household.

Household food security scale

Household Food Insecurity Access Scale (HFIAS) was used to assess the children's household food security status. In HFIAS, a score of 0 indicated food security, 1-4 score indicated mildly food insecurity, 5-8 score indicated moderately food insecurity and score of 9 indicated severe food insecurity [17,18]. This information was captured through interviewing parents or caregivers of children at the household level.

Anthropometrics

Anthropometric assessments were performed according to the World Health Organization standard procedures [19]. Anthropometric measurements (weight and height) were collected in duplicate, using calibrated equipment. The children were not wearing shoes and wore light attire. A portable stadiometer was used to measure height to the nearest 0.1 cm, and a portable Seca solar scale (model 0213) (Seca, Hammer Steindamm, Hamburg, Germany) was used to measure weight to the nearest 0.01 kg. Prior to measurement, the solar scale and stadiometer were calibrated using steel tapes and calibration weights, respectively [20].

The children's anthropometric status was categorised using the World Health Organization's appropriate cut-offs for classification [21]. The World Health Organization's Anthro and AnthroPlus state that measurements of height and weight were translated into age- and sex-specific z-scores in order to determine anthropometric status [19]. The cut-off levels for severe underweight, severe wasting, and severe stunting were −3 SD. Children at risk of wasting were defined as those with weight-for-height z-scores between −2 and ≤−1. The weight-for-height cut-off values for overweight were defined as greater than +2 standard deviations (SD) but less than or equal to +3 SD. Children classified as obese had weight-for-height measurements of greater than +3 SD. When calculating height using weight, a z-score more than one standard deviation was regarded as possibly indicative of overweight.

Dietary diversity score

A 24-hour dietary recall was used to identify commonly consumed food items, which were then included in the Food Frequency Questionnaire (FFQ). Researchers and field workers administered a one-day dietary recall using a

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multiple-pass method to gather information on all foods and beverages consumed in the previous 24 hours. Parents and caregivers were asked to recall all the food consumed by their children, aged 11 to 15 years and in Grade 7, during a 24-hour period. To enhance and verify these reports, children were also asked separately about their food intake over the past 24 hours. Food cards were utilized to assist in recalling the food items and quantities fed to the children.

Using this 24-hour diet recall, dietary diversity scores (DDS) were calculated according to the Food and Agriculture Organization guidelines [22]. The score was defined as the number of food groups consumed by the child during the previous 24 hours. The dietary diversity score was based on the following seven food groups: grains, roots, and tubers; legumes and nuts; dairy products (milk, yogurt, and cheese); flesh foods (meat, fish, poultry, and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables. The score ranged from 0 to 7, with a score below 4 considered low dietary diversity and a score of 4 or above deemed adequate [23].

Dietary intake

The researcher administered a food frequency questionnaire (FFQ) with children aged 11-15 years and parents/caregivers for one day visit. The type, quantity, and frequency of the children's meals were discussed in this interview. The FFQ was adapted from the National Food Consumption Survey of 1999 to accommodate the inclusion of indigenous food. This FFQ included the food items, portion size, and number of times ingested (per day, week, month, seasonal or never). Food cards were used to assist children in remembering the type of food items and the portion sizes consumed. The food for each child was recorded. The FFQ data were captured onto the FoodFinder III™ (South African Medical Research Council, Parow, South Africa) software programme, to determine the nutrient intake. A report containing average daily nutrients intake was generated. Data from the Food Finder was exported to Microsoft Excel, and a mean daily nutrient intakes and standard deviation were calculated. The mean energy and nutrient intake of the children were compared with the Estimated Average Requirements (EAR) and Recommended Dietary Allowance (RDA) [22]. The EAR percentage was calculated using the mean intake value of each nutrient compared to the EAR for that value.

Ethical consideration

This research received ethical clearance from the Research Ethics Committee at the University of Venda (FHS/22/NUT/01/3003), and approval from the provincial and Ehlanzeni District offices, Nkomazi circuit. The Declaration of Helsinki [24], good clinical practices, and South African law were followed during all protocols. Prior to the study, children and their parents received both an oral and written

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description of the study including potential risks. All parents/caregivers of the children provided signed consent, and children signed the assent form.

Statistical analysis

The data collected through completed questionnaires were checked for completeness, coded, and entered into Microsoft Excel (version 2016), before being exported and analyzed with SPSS for Windows version 29 (SPSS Inc. Chicago, IL, USA). Data was exposed to inferential statistics. The anthropometric status of the children was categorized by using appropriate cutoffs for classification [25]. Pearson's correlation coefficients were computed to compare relationships between sociodemographic, dietary intake and anthropometric. The significant level was set at $p < 0.05$.

RESULTS AND DISCUSSION

The study findings showed that most of the children were between the ages of 11-13 years (Table 1). About eighty-five percent of children were receiving child grants. In addition to the child grant received by the households, some family members were also beneficiaries of other government grants: 12.4% received old age grants, 3% received orphan grants, and 4.8% received disability grants. These grants are part of South Africa's social safety net, designed to support vulnerable groups such as the elderly, children without parents, and individuals with disabilities. Of all the children who participated in the study, more than half of their parents were unemployed. About 17.6% of parents/caregivers were employed in government departments with 13.1% in the retail industry. Nearly three quarters of the household had an income above ZAR2000 (100.20 euros). The child grant ($p = 0.013$), parent's employment status ($p = 0.025$), household income ($p = 0.001$) and money spent on food ($p = 0,052$) differed significantly between the age group. The district under study had the highest percentage of people living in poverty, despite having the best income share among the poorest households. Most families spend less than ZAR 2,000 (€100.20) on food, which is significantly below the expected cost of a basic food basket for a family of four in South Africa, estimated at ZAR 3,763.96 [26]. These findings are consistent with reports from KwaZulu-Natal [27]. The findings of this study are consistent with those of Motadi *et al.* [28], who reported that the majority of families in Limpopo province, South Africa, spent less than ZAR 2,000 on food. This suggests that financial constraints prevent adequate food expenditure, leading to compromised dietary quality and increased rates of overweight and malnutrition [29].

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The prevalence of underweight, overweight, and obesity in this study was 4%, 28%, and 13%, respectively. The observed rates of overweight (28%) and obesity (13%) are significantly higher than those reported in the National Food Consumption Survey Fortification Baseline, which recorded 12% overweight and 3.7% obesity [30]. Additionally, the 2016 South African Demographic Health Survey reported a combined prevalence of 27% for overweight and obesity [31]. Moreover, the prevalence of being overweight in the current study was higher than the 12% reported in the 2013 SANHANES-1 [5]. This discrepancy may be attributed to the low dietary diversity among the children in the study, as most had a dietary diversity score below 4, reflecting a lack of variety in their diets. This suggests that households mainly consumed foods from a limited range of food groups, leading to a monotonous diet. A monotonous diet can contribute to overweight and obesity by increasing the likelihood of overeating due to reduced dietary satisfaction and limited nutrient diversity. This imbalance between calorie intake and expenditure can ultimately lead to weight gain [32].

The prevalence of being overweight in the current study was higher among boys (34%) compared to girls (24%). There was a significant difference between boys and girls ($p = 0.024$). The prevalence of overweight and obesity among boys and girls in the current study was higher than those reported in the South African National Health and Nutrition Examination Survey [5]. In that survey, girls had a higher prevalence of overweight and obesity (16.5% and 7.1%, respectively) compared to boys (11.5% and 4.7%). This finding contrasts with the current study, where boys exhibited a higher prevalence of overweight compared to girls. This disparity may be attributed to gender-specific feeding practices in South Africa, where cultural, socio-economic, and nutritional factors significantly influence dietary patterns [33]. In certain communities, gender differences in food allocation are particularly pronounced, with boys often receiving larger portions or more nutrient-dense meals compared to girls. Conversely, girls may face dietary restrictions due to cultural norms or household resource constraints [33]. Research supports this, noting that boys are sometimes prioritized in food distribution within families [12,13].

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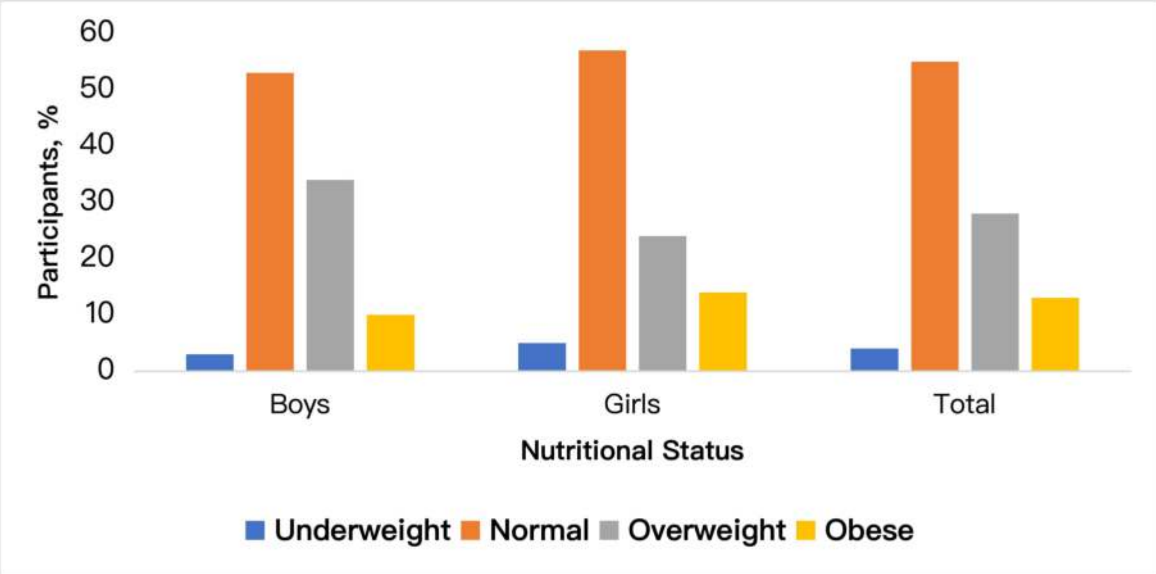

Figure 1: Anthropometric status of children in Mangweni village, Ehlanzeni District (n = 330)

The blue color represents underweight, orange represents normal weight, grey represents overweight, and yellow represents obesity

When using a cutoff score of 4 to distinguish between adequate and inadequate dietary diversity, the majority (73%) of children had scores below 4, indicating inadequate dietary diversity, while 23% had scores greater than 4, reflecting adequate dietary diversity. The study is consistent with report by Motadi *et al*. [35] and Labadarios *et al.* [30]. This variation may be influenced by gender-based differences in feeding practices, which are shaped by cultural, socio-economic, and nutritional factors in South Africa. In some communities, boys and girls may receive different types and quantities of food due to traditional norms and household resource allocation. Studies have shown that boys are sometimes given larger portions or more nutrient-dense meals, while girls may face dietary restrictions influenced by cultural expectations or economic constraints [11–13].

This figure 2 shows those who did not consume the food groups only. The most consumed food groups were grains, roots, tubers (1.8%); other fruits and vegetables (8.4%); and legumes and nuts (34.5%) (figure 3). The least consumed food groups were eggs (74.2%), dairy products (68.2%), flesh foods (78.6%) and vitamin A rich fruits and vegetables (77.6%). In girls, dairy products, eggs and vitamin A rich fruits and vegetables were the least frequently consumed. The consumption of vitamin A rich fruits and vegetables (p = 0.001), eggs (p = 0.023), dairy products (p = 0.012) and legumes (p = 0,051) differed significantly between the age group. Other studies in South Africa and Limpopo have shown that vitamin A rich fruits and vegetables, eggs were the least consumed food [34,35].

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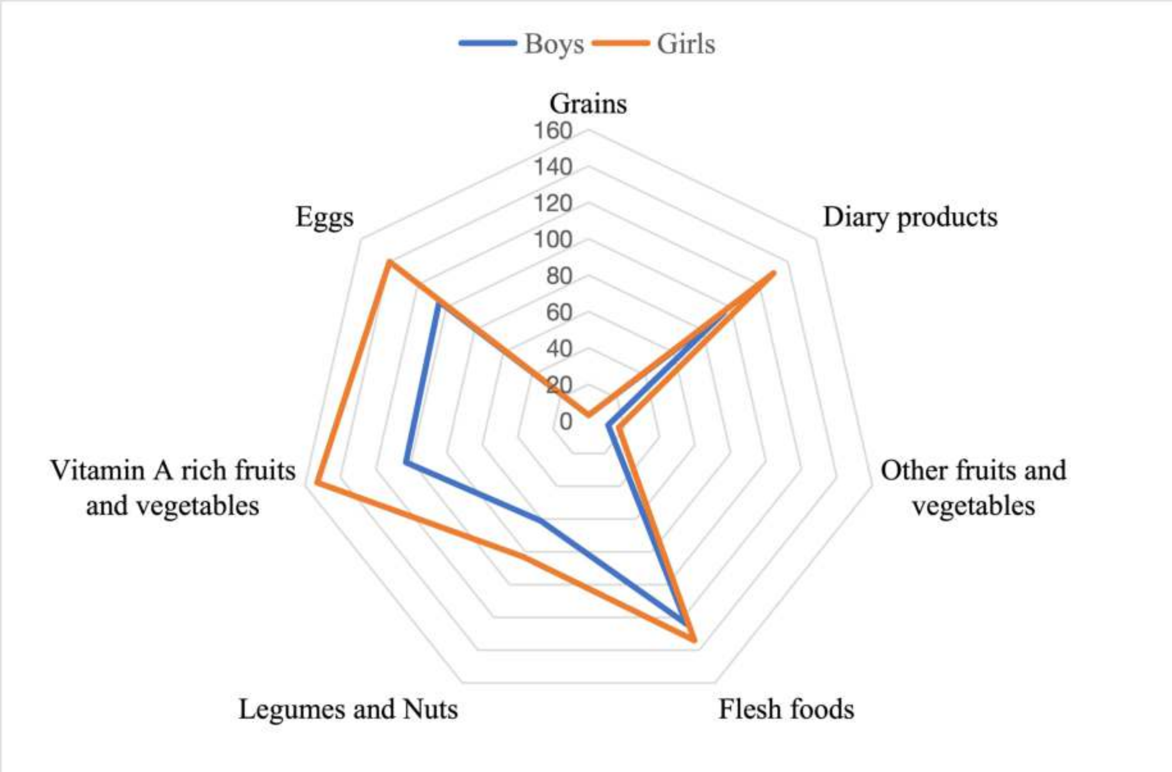

Figure 2: **Frequency of consumption of vitamin A, iron, and zinc rich food (n = 330)**

The findings of the study revealed that 21.8% of the households were food insecure while 43,9% were moderately food insecure and 28.6% were mildly food insecure as per HFIAS categories and only 5.7% children experienced severe food insecurity during the time of the study (figure 4). The level of food insecurity reported in the study may have been exacerbated by high unemployment rates, reduced food expenditure per family, and the reliance on limited incomes. These findings align with similar reports from Limpopo [2,7], East Africa [36], and Pakistan [37]. Access to food is largely determined by household income, a key factor influencing nutritional health. In many food-insecure households, diets may be energy-dense but nutrient-poor, contributing to an increased risk of overweight and obesity in children. If high-calorie foods are not used for energy, they can lead to excessive weight gain. This pattern reflects the global obesity epidemic and is seen in several South African regions, including KwaZulu-Natal, Gauteng, and the Western Cape [38]. Research by Shisana *et al.* [5] and Steyn *et al.* [39] further highlights the persistence of food insecurity and its contribution to malnutrition and obesity.

The mean intake levels of various nutrients among boys and girls were analyzed. Protein intake was 31.51 ± 11.86 g for boys and 33.81 ± 10.58 g for girls. Vitamin

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A intake was 384.39 ± 74.59 µg for boys and 484.78 ± 98.85 µg for girls. Iron intake was 4.89 ± 2.68 mg for boys and 5.19 ± 2.45 mg for girls, while zinc intake was 5.08 ± 2.41 mg for boys and 4.48 ± 1.71 mg for girls. Vitamin B6 intake was 0.41 ± 0.66 mg for boys and 0.37 ± 0.62 mg for girls. Vitamin C intake was 34.38 ± 33.48 mg for boys and 37.19 ± 25.64 mg for girls, while vitamin E intake was 2.97 ± 2.57 mg for boys and 3.37 ± 2.64 mg for girls. Folate intake was 239.50 ± 87.59 µg for boys and 315.07 ± 127.93 µg for girls. None of these intakes met the Recommended Dietary Allowance (RDA) or Estimated Average Requirement (EAR). However, carbohydrate intake (137.21 ± 35.79 g for boys and 139.41 ± 29.72 g for girls), vitamin B12 intake (2.41 ± 3.19 µg for boys and 4.00 ± 5.07 µg for girls), and energy intake (2638.51 ± 630.61 kcal for boys and 3527.19 ± 793.17 kcal for girls) met the recommendations.Nutrient intake during this stage is crucial as it directly influences children's growth and overall health [40]. The growth spurt typically leads to increases in height and weight, with increased energy and nutrient requirements to support rapid development. Adequate intake of vitamins and minerals, including calcium, iron, vitamin A, and zinc, is vital during this time [41]. Deficiencies in these nutrients can hinder both linear growth and body composition. Insufficient iron intake can lead to anemia, which affects physical activity and cognitive function [40]. Poor nutrition during this growth phase may result in stunted growth, underweight conditions, or issues such as overweight and obesity due to imbalances in diet and physical activity [29]. The study showed that households experienced mild to moderate food insecurity, which heightens the risk of nutrient deficiencies in children.

Underweight was positively correlated with dietary zinc ($r = 0.172$; $p = 0.008$) and calcium ($r = 0.146$; $p = 0.008$), indicating that underweight individuals may consume specific nutrient-dense foods but still experience overall inadequate calorie intake or dietary imbalances. Undernutrition often results from insufficient nutrient intake, poor absorption, or ineffective biological utilization of nutrients [44]. These findings align with those of Aurup *et al.* [44], who reported that underweight children had lower intakes of zinc. A negative correlation with dietary carbohydrates ($r = -0.144$; $p = 0.009$) indicates that underweight individuals tend to consume fewer carbohydrates, which are a primary source of energy. This deficiency likely contributes to inadequate energy intake, further exacerbating underweight status. These findings are consistent with previous research. Casey *et al.* [45] found that children from low-income families with underweight children had a low overall food intake. Similarly, Gwelo *et al.* [46] reported that inadequate food intake was a significant factor contributing to the prevalence of underweight in children in KwaZulu-Natal, South Africa.

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Dietary diversity was positively correlated with dietary zinc (r = 0.167; p = 0.002) and vitamin A (r = 0.492; p = 0.001), emphasizing the role of varied diets in improving micronutrient intake. Household income was positively correlated with dietary diversity (r = 0.264; p = 0.013), dietary iron (r = 0.133; p = 0.015), and negatively correlated with vitamin A (r = -0.134; p = 0.001). Higher income likely enhances dietary diversity and iron intake by increasing access to nutrient-rich foods. Similarly, Motadi *et al.* [35] identified low household income as a key factor limiting dietary diversity and micronutrient intake among children in Limpopo Province, South Africa. Likewise, Thomas *et al.* [47] reported that household income significantly influences dietary diversity and nutrient intake in Britain. However, the negative correlation with vitamin A intake suggests that higher-income households may prioritize other food sources over vitamin A-rich options, such as fortified foods or specific vegetables.

Employment status was negatively correlated with dietary iron (r = -0.121; p = 0.028) and vitamin A (r = -0.344; p = 0.052), which may reflect time or access constraints that limit the consumption of nutrient-dense foods. A similar study conducted in Limpopo province, South Africa, found that employment status was a key factor contributing to poor dietary diversity among children [35]. This highlights the broader impact of employment-related factors on overall nutritional quality.

Spending on food was positively associated with a reduction in underweight prevalence (r = 0.172; p = 0.002), indicating that higher spending on food helps decrease underweight cases. These findings are consistent with those reported by Thorne-Lyman *et al*. [48] in Bangladesh, where families that allocated sufficient spending on food were found to have a reduced risk of underweight. However, spending was positively correlated with dietary iron (r = 0.104; p = 0.059) and was negatively correlated with dietary vitamin A (r = -0.234; p = 0.013). This suggests that higher food expenditure may not always lead to improved micronutrient intake, possibly due to a preference for energy-dense, nutrient-poor foods. (Table 3).

A study conducted in the Netherlands over ten years found that food consumption patterns varied according to socioeconomic status [49]. Similarly, Santos *et al.* [50] observed that dietary intake in Pelotas, Brazil, was strongly influenced by social characteristics. Reduced spending on nutritious food likely contributes to poor dietary diversity and the reliance on cheaper, energy-dense, and nutrient-poor foods. Addressing these economic barriers is crucial for improving dietary quality among vulnerable populations. It is important to note that the parents of children in this study were primarily from economically challenged backgrounds, with many unemployed. Unemployment directly limits funds for food, leading to a monotonous diet. The findings of low micronutrient intake align with reports from other developing countries across Africa, including Tanzania [51], Nigeria [52], Ethiopia

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[53], and South Africa [34]. Insufficient consumption of micronutrient-rich foods is closely linked to deficiencies in children. These deficiencies may not always be immediately obvious but can negatively affect physical and cognitive abilities, academic performance, and overall health [54,55]. Addressing these gaps is crucial for supporting the development and well-being of children in economically vulnerable situations.

Study Limitations

The study's sample population was limited to a single rural area in the Ehlanzeni District, so the findings may not be generalizable to all children in the district, though they are likely applicable in similar settings.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Food insecurity and insufficient intake of micronutrient-rich foods particularly vitamin A, iron, and zinc along with rising rates of overweight and obesity among children in the rural areas of Ehlanzeni District, present significant challenges. The intake of protein, vitamin A, iron, zinc, vitamin B6, C and E, folate did not meet recommended dietary allowance and estimated average recommendation. However, carbohydrates, vitamin B12, energy met the RDA and estimated average recommendation EAR. Despite higher income shares among the poorest households, this district has the highest number of individuals experiencing poverty. This study emphasizes the pressing need for more effective interventions that account for socioeconomic disparities and access to affordable, nutrient-dense foods. Addressing these issues is crucial for supporting the growth, development, and well-being of children in economically challenged communities. To improve children's long-term health and nutritional status, it is essential to implement effective school food programs and promote healthy eating practices. The government should consider directly funding schools to procure nutritious food for learners, eliminating the tender system that may hinder such efforts.

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NKP conceptualized the study, its design, coordination of data collection, data entry, ZMK analysed, and interpretation of the data. MSA and MA supervised the whole process and drafted the manuscript. ZMK and MSA reviewed the manuscript. All authors have read and approved of the final version of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

Data availability statement

The supporting data are available through the corresponding author

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Table 1: Socio-demographic information of study Households and the children in Mangweni village, South Africa

	Boys		Girls		P-value
	n	%	n	%	
Child					
Age, y					
11 - 13 years	65	19.6	109	33.8	0.463
14 - 15 years	60	18.3	96	29.1	
Educational level					
Grade 7	134	40.6	196	59.4	
Child grant					
Yes	113	34.2	168	50.9	0.013
No	21	6.4	28	8.4	
Parents					
Employment status					
Yes	67	20.3	89	27	0.025
No	67	20.3	107	32.4	
Type of employment					
Government	20	6.1	38	11.5	0.367
Retail	24	7.4	19	5.7	
Mining sector	9	2.7	16	4.8	
Security	14	4.3	16	4.8	
Household income					
<ZAR2000.00	35	10.6	57	17.3	0.001
>ZAR2000.00	99	30	139	42.1	
Money spent on food					
<ZAR2000.00	97	29.3	136	41.3	0.052
>ZAR2000.00	37	11.2	60	18.2	
Other types of grants in the household					
Old age grant	41	12.4	54	16.4	0.217
Orphanage grant	10	3	22	6.6	
Disability grant	16	4.8	14	4.2	

1 euro is equivalent to R 20.31

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Table 2: Nutrient intake of the study children in Mangweni village in South Africa

	Boys			Girls			
Nutrients (Units)	**Intake**	**RDA[a]**	**EAR[b]**	**Intake**	**RDA[a]**	**EAR[b]**	**p-value**
Energy (kcal)	2640 ± 630	2280	-	3530 ±790	3150	-	**0.001**
Carbohydrates (g)	137 ± 36	130	130	139 ± 30	130	130	0.173
Protein (g)	31.51±11.86	0.95	0.76	33.81±10.58	0.85	0.71	**0.024**
Fat (g)	20.34±11.60	-	-	21.63±11.63	-	-	0.267
Fiber (g)	8.21±3.760	-	-	8.63±3.29	-	-	0.345
Calcium (mg)	229 ± 139	1300	1055	263 ±141	-	-	**0.013**
Iron (mg)	4.89±2.68	8	5.9	5.19±2.45	11	7.7	**0.034**
Zinc (mg)	5.08±2.41	8	7	4.48±1.71	11	8.5	0.356
Riboflavin (mg)	0.07±0.32	0.9	0.8	0.07±0.26	1.1	1.3	0.239
Thiamin	0.04±0.22	1.0	0.9	0.03±0.18	1.0	0.9	0.321
Vitamin B6 (mg)	0.41±0.66	1.0	0.8	0.37±0.62	1.3	1.1	0.467
Folate (µg)	240 ±88	300	250	315 ±128	400	330	**0.014**
Vitamin A (RE) (µg)	384.4 ±74.6	600	445	484.8±98.8	900	630	0.052
Vitamin B12 (µg)	2.41±3.19	1.8	1.5	4.00±5.07	2.4	2	**0.016**
Vitamin C (mg)	34.4±33.5	45	39	37.2±25.6	75	63	0.391
Vitamin E (mg)	2.97±2.57	11	9	3.37±2.64	15	12	**0.015**

[a]Recommended Dietary Allowance, [b]Estimated Average Requirements

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Table 3: Association between sociodemographic, dietary intake and anthropometrics of Study children in Mangweni village, South Africa

	Underweight	Overweight	Obesity	Dietary diversity	Iron, Diet	Vitamin A, diet
Average score						
r	**-0.114**	-0.043	0.010	-0.009	0.020	0.452
p	**0.039**	0.686	0.952	0.875	0.719	0.246
Carbohydrate, diet						
r	**-0.144**	0.070	-0.129	0.043	0.018	0.452
p	**0.009**	0.512	0.414	0.435	0.744	0.746
Calcium, diet						
r	**0.146**	0.185	-0.040	0.065	**0.225**	0.352
p	**0.008**	0.079	0.803	0.240	**<0.001**	0.536
Zinc, diet						
r	**0.172**	0.052	-0.104	**0.167**	0.012	0.082
p	**0.002**	0.346	0.328	**0.002**	0.827	0.446
Vitamin A, diet						
r	0.086	0.048	0.002	**0.492**	**0.246**	-
p	0.120	0.649	0.989	**0.001**	**<0.001**	
Household income						
r	0.041	-0.028	0.288	**0.264**	**0.133**	**-0.134**
p	0.453	0.792	0.064	**0.013**	**0.015**	**0.001**
Employment status						
r	-0.074	-0.001	-0.222	-0.033	**-0.121**	**-0.344**
p	0.181	0.995	0.158	0.553	**0.028**	**0.052**
Money spent on food						
r	**-0.172**	-0.153	0.287	0.019	**-0.104**	**-0.234**
p	**0.002**	0.149	0.66	0.733	**0.059**	**0.013**

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