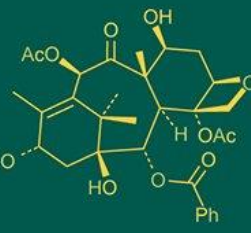
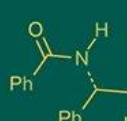


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Impact of Socio-Demographic Factors and Educational Interventions on Nutritional Status and Physical Activity among Urban Adolescent Girls of Vijayapura District of Karnataka

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Abstract

Adolescence is a transitional stage of development between childhood and adulthood, associated with significant physical growth, reproductive maturation, and cognitive transformations. This study investigated the impact of socio-demographic factors and educational interventions on the nutritional status and physical activity levels of urban adolescent girls in Vijayapura District, Karnataka. A total of 390 adolescent girls aged 13 to 16 years were selected from 13 talukas. Results revealed that 64.1% of the respondents had a normal BMI, while 11.5% were overweight, 9.2% were obese, 9.2% were thin, and 5.9% were severely thin. Physical activity levels varied, with 49.2% having medium physical activity, 31% having low physical activity, and 19.7% having high physical activity. Dietary assessments indicated that many adolescents did not meet the recommended intake for various food groups, leading to deficiencies in essential nutrients such as iron, calcium, and vitamin D.

Socio-demographic factors such as parental education, occupation, and income significantly influenced the nutritional status and physical activity levels of the adolescents. For instance, girls whose parents had higher education levels were more likely to engage in physical activity and have better nutritional status. Additionally, menstrual problems were prevalent among the participants, with all reporting back pain and abdominal pain, and a significant proportion experiencing menstrual pain, muscle cramps, and fatigue.

The intervention through nutrition education demonstrated a significant improvement in the nutritional knowledge of the participants, as evidenced by higher post-test scores compared to pre-test scores. This indicates the potential of educational programs to enhance the dietary habits and overall health of adolescent girls. From the results, it is evident that urban adolescent girls in Vijayapura district face significant nutritional challenges, exacerbated by socio-economic factors. The study underscores the importance of addressing these barriers and providing comprehensive nutrition education to support the well-being of adolescent girls.

Keywords: Adolescent girls, Nutritional status, Anthropometric measurements, Dietary habits, Physical activity

Introduction

Adolescence, a pivotal stage in human development, is characterized by significant physical, cognitive, and emotional changes. Proper nutrition during this critical period is essential for the maintenance of overall health and the facilitation of optimal growth and maturation. Adolescent girls, in particular, face unique nutritional challenges due to the physiological demands of their growth spurt, the onset of menstruation, and sociocultural factors that may influence their dietary habits. The nutritional requirements of adolescents girls are higher than children's due to the accelerated growth rate, sexual maturation, changes in body composition, skeletal mineralization, and fluctuations in physical activity levels (Parks *et al.*, 2020). (Anand & Sharma, 2023) Adolescent girls are particularly vulnerable to nutritional deficiencies, such as iron deficiency anaemia, which can impact their cognitive development, immune function, and overall well-being. (Armstrong *et al.*, 2018) ^[2] Existing research has highlighted significant disparities in physical activity levels among adolescents and young adults, with female adolescents and those from lower-income or minority racial/ethnic backgrounds being less likely to meet the recommended guidelines for physical activity.

These disparities are influenced by various interpersonal and environmental factors, such as social norms, access to resources, and competing priorities. (Christian & Smith, 2018) [3] Studies have also shown that many adolescents do not come close to meeting intake recommendations for nutrient-rich foods, such as fruit, vegetables, and milk. 3,6. Together, these dietary behaviours place adolescents at increased risk for micronutrient deficiencies. Many children in low- and middle-income countries enter adolescence thin, stunted, and anaemic, and often display other micronutrient deficiencies. Considering all these factors, an investigation was made to know the impact of Socio-Demographic Factors and Educational Interventions on Nutritional Status and Physical Activity Among Urban Adolescent Girls of Vijayapura District of Karnataka"

Materials and Methods

The present study was conducted to assess the nutritional status and physical activity of urban adolescent girls of Vijayapura district, thirteen talukas namely Almela, Muddebihal, Bableshwar, Nidagundi, Basavana Bagevadi, Chadchan, Sindagi, Talikoti, Devara Hipparagi, Tikota, Indi, Kolhar, Vijayapura were selected for the study. The study was also intended to focus on the growth of adolescent girls through anthropometric measurements.

Selection of subjects – a total of 390 adolescent girls aged 13 to 16 years were selected from 13 taluk of Vijayapura district of Karnataka 30 subjects from each taluka were selected and interviewed. The methods used for collecting data are as follows - a self-structured questionnaire was developed which contains socio-economic information, anthropometric measurements, morbidity patterns, and clinical history of deficiencies of adolescent girls, Jelliffe (1966) [9] and Physical Activity Questionnaire for Adolescents (PAQ-A) Kowalski *et al.*(2004) [11] were recorded by interviewing. Prior permission was taken from the institute head to conduct the research in the schools. The adolescents as well as the institute head were informed about the research and were informed about confidentiality. Later the informed consent was taken from the adolescents to participate in the study. The self-structured questionnaire which consists of questions regarding food habits was used to assess the food habits of adolescent girls in urban areas. The questionnaire is similar to the questionnaire prepared by Das (2020). The anthropometric measurements of subjects were recorded by using standard procedures. Measurements included height, weight, Body weights of adolescent girls, which were measured to the nearest 0.1 kg with the help of portable weighing machine. Adolescent girls were weighed

without shoes and with minimum clothing. Heights of subjects were measured to the nearest 0.1 cm by no stretchable measuring tape. The subject was asked to stand straight as possible on a flat floor without shoes. Height and weight were used to calculate the BMI for age using WHO-Anthroplus.

Diet survey: The diet survey was conducted to collect information about dietary pattern by using questionnaire schedule to record data regarding their frequency of consumption of different food groups in a day, week and monthly. 24 hour recall method was used to know the dietary pattern.

Intervention: The nutrition education was given using lectures on balanced diet, basic five food groups and impact of skipping of breakfast. The pre-test- and post- test was done by using the self-structured questionnaire to know the impact of intervention

Statistical analysis: Statistical analysis of collected data was carried out after consolidation and computation into frequencies and percentages, correlation coefficient was done

Results and Discussion

Table 1 showed the sociodemographic profile of the individuals' urban parents. The majority of urban moms (58.5%) had completed high school, followed by a primary school certificate (33.10%), a graduate degree (6.9%), and an intermediate or diploma (1.50%). The urban mothers were all literate. The majority of urban fathers (34.6%) had either a diploma or an intermediate degree. Approximately 23% of urban dads were graduates, followed by 15.1% with a high school diploma, 11% with no literacy, 8.5% with a primary school diploma, and 7.70% with a professional or honours degree. When income and occupation are taken into account, the results indicated that the majority of dads (47.7%) were skilled workers and shop owners and market sales people, while the majority of urban parents (39.5%) earned between Rs. 18,497 and Rs. 30,830. Additionally, among urban adolescent girls, physical activity was found to significantly positively correlate with the father's work, education, and socioeconomic level. Adolescents with highly educated parents were found to be more physically active (Marko *et al.*, 2007) [4]. It suggests that higher levels of physical activity are also associated with greater father education, occupation, and socioeconomic position.

Table 1: Socio-demographic profile of parents of urban adolescent girls N=390

Variables	Category	Frequency	Percentage
Mothers education	Illiterate	-	-
	Primary school certificate (1 to 7)	129	33.10
	High school (8 to 10)	228	58.50
	Intermediate or diploma (11 to 12)	6	1.50
	Graduate	27	6.90
Fathers education	Illiterate	43	11.00
	Primary school certificate (1 to 7)	33	8.50
	High school (8 to 10)	59	15.10
	Intermediate or diploma (11 to 12)	135	34.60
	Graduate	90	23.10
	Profession or Honours	30	7.70
Income (Rs)	<6174	26	6.70
	6,175 - 18,496	183	46.90

	18,497 - 30,830	154	39.50
	30,831 - 46,128	26	6.70
	46129 - 61,662	1	0.30
	61,663 - 123,321	-	-
	>123,322	-	-
Occupation	Unemployed	3	0.80
	Elementary Occupation	21	5.40
	Plant & Machine Operators and Assemblers	9	2.30
	Skilled Agricultural & Fishery Workers	100	25.60
	Skilled Workers and Shop & Market Sales Workers	186	47.70
	Clerks	12	3.10
	Technicians and Associate Professionals	1	0.30
	Professionals	58	14.90
	Legislators, Senior Officials & Managers	-	-

Table 2 shows the distribution of urban adolescent girls according to BMI-for-age indicated that the majority were in the normal category (64.1%), followed by overweight (11.5%), obese (9.2%), thin (9.2%), and severely thin (5.9%). The findings suggest that most urban adolescent girls in Vijayapura district had normal BMI-for-age, moderate physical activity levels, and good sleep quality. The proportion of girls classified as obese and severely thin was relatively low. Similar findings were reported by Seema *et al.* (2021) [12], who observed that a majority of adolescents had normal BMI, while 6.8 per cent were obese. Anmol *et al.* (2020) [1] also reported comparable results and noted a higher prevalence of overweight and obesity among adolescents in urban areas.

Table 2: Distribution of urban sample according to BMI for age (WHO classification) N=390

BMI for age (Z-scores)	Frequency	Percentage
Obese (>+2SD)	36	9.20
Over weight (>+1SD)	45	11.50
Normal (+1SD)	250	64.10
Thin (<-2 SD)	36	9.20
Severe thinness (<-3 SD)	23	5.90

Table 3 depicts the physical activity status of urban adolescent girls. The results indicate that 49.2 per cent of the participants were engaged in a moderate level of physical activity. About 31.0 per cent exhibited low physical activity, whereas nearly one-fifth (20.0%) reported high levels of physical activity. Statistical analysis demonstrated a significant variation in the physical activity levels among urban adolescent girls. A comparable trend was reported by Guillaume *et al.* (2021) [8], who observed significant differences in the physical activity patterns of urban adolescents.

Table 3: Physical activity levels of urban adolescent girls N=390

Physical activity	Frequency	Percentage
Low	121	31.00
Medium	192	49.20
High	77	19.70

Table 4 shows the mean percentage intake of different food groups among urban adolescent girls. The highest intake was observed for cereals (56.75%), followed by fats and oils (54.60%) and milk and milk products (43.50%). Lower intakes were recorded for pulses (23.00%), vegetables, fruits, nuts and oilseeds, while meat and meat products had

the lowest intake (3.82%). Similar findings were reported by Kahssay *et al.* (2020) [10].

Table 4: Mean percentage of daily intake of nutrients by urban adolescent girls N=390

Food stuffs	Urban (n=390)
	Mean $\pm$ SD
Cereals	56.75 $\pm$ 34.09
Pulses	23.00 $\pm$ 10.89
Green leafy vegetables	19.75 $\pm$ 8.25
Other vegetables	24.84 $\pm$ 22.28
Fruits	19.14 $\pm$ 9.99
Nuts and oil seeds	20.52 $\pm$ 12.74
Milk and milk products	43.50 $\pm$ 19.35
Meat and meat products	3.82 $\pm$ 3.09
Sugars	38.95 $\pm$ 10.96
Oils and fats	54.60 $\pm$ 14.03

Table 5 presents the nutrient adequacy of urban adolescent girls. The mean intake of energy, protein, fat, iron, zinc, calcium, potassium, carbohydrate, and vitamin D was assessed and compared with recommended levels. The nutrient adequacy ratio was highest for carbohydrates (168.51%) and vitamin D (155.67%). In contrast, adequacy ratios for energy (58.93%), iron (58.24%), zinc (56.54%), calcium (28.46%), and potassium (60.67%) were below recommended levels. Protein (94.36%) and fat (85.49%) showed relatively better adequacy among the participants.

Table 5: Nutrient adequacy of urban adolescent girls N=390

Nutrients	Mean $\pm$ SD	RDA	% NAR
Energy (kcal)	1374.01 $\pm$ 181.50	2330	58.93
Carbohydrate (g)	219.06 $\pm$ 22.58	130	168.51
Protein (g)	40.57 $\pm$ 5.59	43	94.36
Fat (g)	34.19 $\pm$ 9.91	40	85.49
Iron (mg)	17.47 $\pm$ 2.71	30	58.24
Zinc (mg)	7.23 $\pm$ 1.02	12.8	56.54
Calcium (mg)	284.55 $\pm$ 119.88	1000	28.46
Potassium (mg)	2129.52 $\pm$ 338.33	3510	60.67
Vitamin D (μ g)	23.34 $\pm$ 8.40	15	155.67

Table 6 presents the clinical assessment of urban adolescent girls. Most participants exhibited normal appearance (89.0%), skin (85.6%), face (95.9%), eyes (90.0%), lips (91.0%), tongue (91.0%), teeth (86.2%), gums (94.9%), nails (95.1%), muscles (97.2%), and posture (100%). Black, shiny, and smooth hair was observed in 65.1 per cent of the girls. Similar findings were reported by Sridhar *et al.* (2014) and Vaishnav *et al.* (2013) [14, 16].

Table 6: Clinical signs and symptoms of urban adolescent girls N=390

Variables	Category	Frequency	Percentage
Appearance	Normal	347	89.00
	Overweight	-	-
	Thin	43	11.00
Skin	Dry flaky	48	12.40
	Excessive bruising	8	2.10
	Normal	334	85.60
	Pinpoint purplish haemorrhagic spot	-	-
Hair	Thin, sparse, dry, lustreless, easily pluckable	84	21.50
	Black, shiny, smooth	254	65.10
	Change in pigment with distinct bands	52	13.30
	Normal	-	-
Face	Normal	374	95.90
	Pale	4	1.00
	Scaling	8	2.10
	Swollen	4	1.00
Eyes	Dry and scaly at corners	4	1.00
	Increased vascularity	-	-
	Normal	351	90.00
	Pale	-	-
Lips	Sensitive to bright light	35	9.00
	Normal pink	355	91.00
	Fissuring at corners	27	6.90
	Swollen	8	2.10
Tongue	Magenta red	-	-
	Normal pink	355	91.00
	Pale	20	5.10
	Raw, scarlet red	8	2.10
Teeth	Swollen	7	1.80
	Caries	8	2.10
	Cavities	15	3.80
	Cracks	8	2.10
Gums	Mottled	23	5.90
	Well aligned / white	336	86.20
	Bleeding	12	3.10
	Normal pink colour	370	94.90
Nails	Spongy swollen gums	8	2.10
	Brittle/ridged	19	4.90
	Normal size	371	95.10
	Spoon shaped	-	-
Muscles	Normal	379	97.20
	Sore, painful	7	1.80
	Wasted	4	1.00
	Weak	-	-
Skeletal	Good posture	390	100.00
	Poor posture	-	-

Table 7 presents the menstrual problems experienced by urban adolescent girls. The findings revealed that all participants reported back pain, breast pain, abdominal pain, diarrhoea, and vomiting (100% each). A high proportion of

girls also experienced fatigue (93.78%), nausea (90.46%), menstrual pain (87.63%), and muscle cramps (58.93%). Similar observations were reported by Beeva *et al.* (2020) [5] and Sivagurunathan *et al.* (2015) [14].

Table 7: Menstrual problems among urban adolescent girls N=390

Disorders	Yes/ No	Frequency	Percentage
Back pain	No	-	-
	Yes	390	100.00
Menstrual pain	No	48	12.37
	Yes	342	87.63
Muscle Cramps	No	160	41.07
	Yes	230	58.93
Nausea	No	36	9.24
	Yes	354	90.46
Breast pain	No	-	-
	Yes	390	100.00
Tiredness/ fatigue	No	24	6.15
	Yes	366	93.78
Abdominal pain	No	-	-
	Yes	390	100.00
Diarrhoea	No	-	-
	Yes	390	100.00
Vomiting	No	-	-
	Yes	390	100.00
Headache	No	390	100.00
	Yes	-	-

Table 8 shows the association between BMI-for-age and physical activity among urban adolescent girls. The analysis indicated no significant association between BMI-for-age and physical activity levels. Most obese (50.0%), overweight (53.3%), normal-weight (47.2%), thin (50.0%), and severely thin (60.9%) girls were engaged in moderate physical activity. Sinha *et al.* (2022) reported a higher prevalence of overweight and underweight among urban adolescent girls compared to their rural counterparts, which differs from the findings of the present study.

Table 8: Association of BMI for age (WHO classification) with physical activity of urban adolescent girls N=390

Variables	Physical activity				X ²
		High	Medium	Low	
BMI	Obese (>+2SD)	7 (19.4)	18 (50.0)	11 (30.6)	10.546 ^{NS}
	Over weight (>+1SD)	12 (26.7)	24 (53.3)	9 (20.0)	
	Normal (+1SD)	52 (20.8)	118 (47.2)	80 (32.0)	
	Thin (<-2 SD)	2 (5.6)	18 (50.0)	16 (44.4)	
	Severe thinness (<-3 SD)	4 (17.4)	14 (60.9)	5 (21.7)	

NS- non significant

Figure 1 illustrates the relationship between selected independent variables and the nutritional status of urban adolescent girls. BMI-for-age showed a significant negative association with the father's occupation, indicating that girls whose fathers had higher occupational status were less likely to be overweight or obese. Physical activity was positively and significantly associated with the father's education, occupation, and socio-economic status. This suggests that better parental education, occupational status, and socio-economic conditions were linked to higher levels of physical activity among urban adolescent girls.

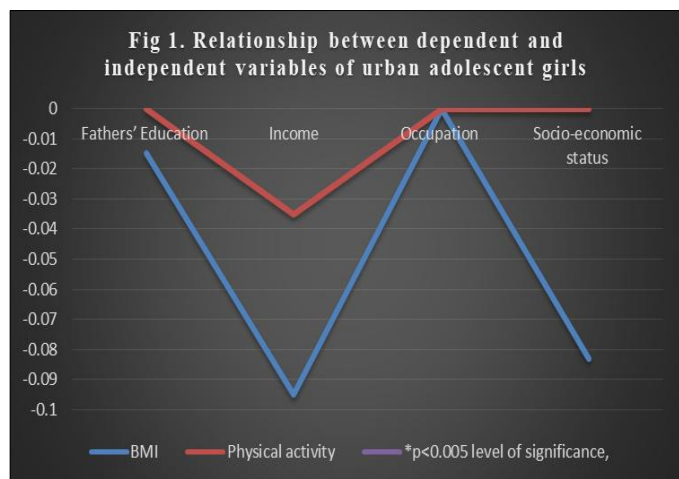


Fig 1: Relationship between dependent and independent variables of urban adolescent girls

Table 9 depicts the impact of nutrition education on urban adolescent girls. It was revealed that pre-test and post-test scores of urban adolescent girls differed significantly. The post-test scores of urban adolescent girls were higher than the pre-test scores. This shows that nutrition education was successful in improving the nutritional awareness of urban and adolescent girls. These results are in line with the study conducted by Elena *et al.* (2017) [6] who reported that there was an improvement in nutrition knowledge of the study participants. Gordana *et al.* (2023) [7] found that the intervention program on nutrition education improved the nutritional awareness and understanding of the participants.

Table 9: Impact of nutrition education among urban and rural adolescent girls N=390

Locality		Mean $\pm$ SD	t	Difference
Urban	Pre-test	10.27 $\pm$ 1.79	9.744**	3.63
	Post-test	13.90 $\pm$ 1.66		

Conclusion

This study assessed the nutritional status, dietary habits, and physical activity levels of urban adolescent girls in Vijayapura district of Karnataka. The study also concluded that socio-demographic factors, educational interventions, and nutrient adequacy play crucial roles in determining the nutritional status and physical activity levels of urban adolescent girls in Vijayapura district of Karnataka. Adolescent girls with parents who had higher education levels and better socio-economic status were more likely to have a normal BMI and higher levels of physical activity. Additionally, the prevalence of menstrual issues such as back pain, abdominal pain, and fatigue was influenced by these socio-demographic factors. Nutrient adequacy was a significant concern, with many girls showing deficiencies in essential nutrients like iron, calcium, and vitamin D. The educational intervention, which provided nutrition education, significantly improved the nutritional knowledge of the participants, as evidenced by higher post-test scores compared to pre-test scores. This highlights the importance of targeted educational programs to address nutritional deficiencies and promote healthier lifestyles among adolescent girls, particularly those from lower socio-economic backgrounds. Addressing socio-economic barriers, ensuring nutrient adequacy, and providing comprehensive nutrition education are essential strategies for enhancing the overall well-being of urban adolescent girls.

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