Research Article

Scientific Research Exploring Adolescent Lifestyle Behaviors, Nutrition Patterns, and Long-Term Pediatric Health Promotion Outcomes across Communities

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Abstract

Adolescent lifestyle habits and nutrition habits have a profound impact on physical, mental and developmental health outcomes for a lifetime. Eating patterns, activity, sleep, and screen time vary among communities and can have an impact on children's health promotion and cancer risk. The aim of this study was to assess the relationship between lifestyle behaviors, nutrition pattern and long-term health consequences among urban, semi-urban and rural adolescent population. A cross sectional community-based study was carried out in 420 adolescents between 12 and 18 years of age with the aim of obtaining information from validated questionnaires and anthropometric measures. Data were analyzed descriptively, correlation analysis, multiple regression and ANOVA were used. This study found positive relationship between improved diet, physical activity and sleep quality and health promotion outcomes, and negative relationship between excessive screen time and outcomes. The results highlight the importance of targeted interventions and health promotion programs that can enhance the health and wellbeing of adolescents, and help to ensure positive pediatric outcomes that are sustainable in the community.

Keywords

Adolescent Health, Lifestyle Behaviors, Nutrition Patterns, Physical Activity, Pediatric Health Promotion, Community Health Outcomes.

1. Introduction

Adolescence is a crucial age of physical, psychological and social growth and a time that shapes a person's health and well-being throughout their life. A range of lifestyle factors, including physical activity, nutrition, sleep and screen time also have a significant impact on growth, development and future health during this time. Physical activity is related to a healthy body composition, cardiovascular fitness and mental health while sedentary behaviors and excess screen time are linked to obesity, impaired learning and mental health effects. Likewise, there are important linkages between sleep and cognitive, emotional, and physiological processes.

The nutritional habits of adolescents are also significant because during their growth spurt, the need for nutrients increases greatly. Dietary diversity and frequent eating of fruits and vegetables are associated with a healthy nutrition profile in support of healthy development; frequent consumption of fast food and sugar sweetened beverages are associated with unhealthy nutrition profiles associated with overweight and obesity as well as metabolic disorders. But, nutrition practices may be different based on socioeconomic and environmental factors.

Other elements of the community mold adolescent health behaviors. There are divergent patterns of access to safe foods, recreation facilities, health education, and health services between these different population segments, as well as different patterns of community lifestyles and health, which vary by urban and non-urban areas. Such disparities can impact long term health promotion outcomes in children such as healthy growth, mental wellness, obesity prevention, decreasing non-communicable disease risk, and embedding healthy practices.

Although several studies have investigated the impact among adolescents of various combinations of lifestyle behaviors and nutrition patterns, little work has done so to date in a comprehensive way. The purpose of this study is; therefore, to measure adolescent lifestyle behaviours, explore their relation with pediatric health outcomes and to establish a Pediatric Health Promotion Index for the measurement of health promotion outcomes at a later stage among adolescent learners.

2. Related Work

In recent years, the role of lifestyle behaviors in adolescent health outcomes has come into focus globally [2]. Adolescents have experienced rapid transformations in their physical activity, diet, sleep patterns, and recreation in recent years as a result of physical, cultural, and technological changes [1]. Research from various countries has found reductions in the amount of physical activity and increases in sedentary activities, including excessive time in front of screens and electronic gadgets [7]. These trends have caused concerns about obesity, mental health and risk of chronic disease in the future [6].

There have also been significant changes in the nutrition profile of adolescents [12]. Multiple studies have found the consumption of fruits, vegetables, and foods rich in nutrients decreased while fast food, processed snack foods, and sugar-sweetened drinks increased [1]. As a result of poor nutritional intake, it has been associated with several nutritional deficiencies, unhealthy weight gain, poor cognitive function and decreased overall quality of well-being [11]. Adolescent nutrition is important for balanced nutrition because they have heightened requirements for nutrients to promote growth and physiological development [12].

There are also inequalities in health outcomes at the community level which further contribute to health inequalities at the adolescent level [13]. Processed foods and lack of physical activity are common in urban areas, whereas in rural areas are a lack of access to healthcare, diversity in food intake and health education [2]. Socioeconomic status, parental education, and environmental factors have been found as important factors that affect lifestyle choices and health behaviours [8].

Consistent associations have been found between physical activity, healthful diet, appropriate sleep and better health in children across a number of previous studies [14]. A number of school-based and community-based health promotion interventions have been employed to foster healthy habits in adolescents, with some showing positive, but context-specific outcomes [3]. Research on children's and adolescents' movement behavior suggests that there is a complex interaction between physical activity, screen time and sleep and how this affects health outcomes among children and adolescents [9]. Previous studies have also revealed results concerning the three-way interaction of physical activity, screen time and sleep quality with adolescent adiposity and health status [11]. Additionally, lifestyle factors have been shown to form clusters throughout the adolescent years and to affect the pathways of health in the future [4]. The duration, regularity and behavior around sleep also have been identified as significant determinants of long-term health and well-being [5]. A few studies have also suggested correlations between physical activity levels, screen exposure duration, sleep hygiene and learning performance, cognitive abilities, and growth and development in children and youths [10]. Most studies are however undertaken individually exploring the impact of a specific lifestyle or nutrition factor in isolation, rather than on the cumulative effect of all factors across different community contexts. Therefore, a need exists for integrated research which is able to measure several determinants at once. This study aims to fill this void by examining lifestyle behaviours, nutrition patterns and long-term outcomes of health promotion for children across different communities and suggest a holistic framework of assessment for child health evaluation.

3. Materials and Methods

3.1 Study Design and Setting

The aim of this community-based analytical cross-sectional study was to explore the relationship between adolescents' lifestyle behaviours, nutrition and the outcomes of long-term paediatric health promotion. This study was conducted with a sample of urban, semi-urban and rural, 12- to 18-year-old adolescents. These were chosen to reflect variations in home environment, feeding cultures, levels of activity, availability of health services and socioeconomic factors that could affect the health of the adolescents. Standardised instruments were used to conduct the data collection through the school-based surveys and health assessment. Data on lifestyle behavior, eating patterns, and measures of health was gathered in one study session. Cross-sectional design allowed for an evaluation of current behaviors and dietary patterns within various community settings, and for comparison of children's health promotion results within the subgroups of adolescents.

3.2 Study Population and Sampling Procedure

These were secondary school students between ages 12 and 18 in selected urban, semi-urban and rural secondary schools in the study area. For cross sectional study, type of sample size estimation formula used was Cochran's sample size estimation formula: The sample size n was calculated as follows:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where Z = 1.96 for a 95% confidence level, P = 0.50 representing the estimated prevalence, and d = 0.05 representing the margin of error. Based on the calculation, 384 participants were needed for the sample size. A total sample size of 420 adolescents was arrived at by adding an additional 10% due to the possibility of non-response and incomplete questionnaires.

A multistage stratified random sampling technique was used. At the first stage the urban, semi-urban and rural areas were chosen so that there is representation of various socio-economic and environmental settings. Secondary schools were randomly selected in the second stage from each community. Finally, qualifying adolescent girls were selected by stratified random sampling by age group and gender to ensure balanced sampling.

The inclusion criteria were students aged 12-18 years and consented by parents as well as by the students. Students aged between 12 and 18 years of the selected schools and who had their parents' consent and were agreeable to participate in the study were included. Adolescents who had chronic medical conditions that were identified by the researchers and known to the adolescent, those who were receiving long-term medication for chronic medical conditions, and those who did not complete questionnaires and/or refused to participate were excluded. This sampling method ensured that the study population was sampled as representative as possible and with minimum selection bias.

3.3 Conceptual Framework and Study Variables

This study used the conceptual framework shown in Figure 1, which explains how the community characteristics, lifestyle behaviors and nutrition patterns impact the promotion of long-term pediatric health. Figure 1 reveals that the urban, semi-urban and rural environments in which adolescents live are different and have a distinct effect on their lifestyle and dietary habits. They connect directly with lifestyle behavior factors and activities, namely the amount of physical activity, screen time, sleep times, and sedentary behavior as well as nutrition factors, including how many fruits are consumed, how many vegetables are consumed, how much fast food is consumed, how many sugary beverages are consumed, and dietary diversity. These factors impact intermediate health markers such as BMI-for-age, wellness score and nutrition status. These indicators then measure the long-term health promotion results for children: healthy growth, obesity prevention, mental well-being, disease risk reduction, and health sustainability. These positive health outcomes that can be fed back to create increased support for healthier lifestyle and nutrition habits in the long run are represented in Figure 1.

The study variables were divided into independent and dependent variables. The independent variables included lifestyle factors (physical activity duration, screen exposure time, sleep duration and sedentary behavior), nutrition factors (fruit intake, vegetable intake, fast-food intake, sugary beverage intake, dietary diversity score), and socio-demographic factors (age, gender, community type, family income and parental education). The following three composite scores represented overall health promotion outcomes among adolescents and were considered the dependent variables: BMI-for-age percentile, Wellness Score, and Pediatric Health Promotion Index (PHPI).

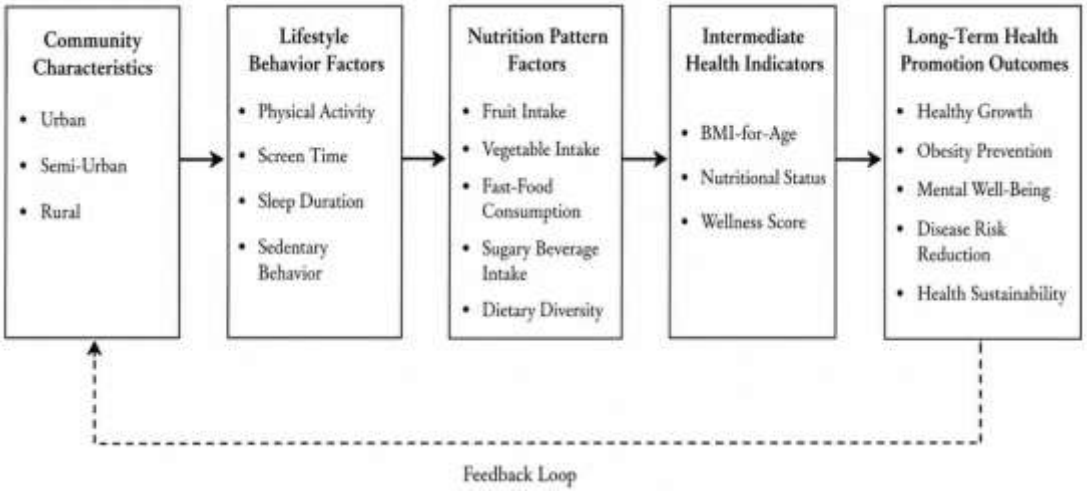

Figure 1. Conceptual Framework of Adolescent Health Promotion.

3.4 Data Collection and Anthropometric Assessment

Data were collected using a structured questionnaire developed from previously validated adolescent health assessment tools. The questionnaire gathered information on demographic characteristics, lifestyle behaviors, dietary habits, physical activity levels, screen exposure, and sleep patterns. Dietary intake was assessed using a Food Frequency Questionnaire, while physical activity and sleep behaviors were evaluated through standardized self-report measures. All questionnaires were administered under the supervision of trained researchers to ensure consistency and completeness of responses.

Anthometric measurements were obtained following standard World Health Organization guidelines. Body weight was measured to the nearest 0.1 kg using a calibrated digital weighing scale with participants wearing light clothing and no footwear. Height was measured to the nearest 0.1 cm using a portable stadiometer while participants stood upright in the Frankfurt plane position. Body Mass Index (BMI) was calculated using the formula:

$$BMI = \frac{Weight(kg)}{Height(m)^2}$$

The calculated BMI values were converted into age- and sex-specific BMI percentiles for the assessment of nutritional status and growth patterns among adolescents. These measurements were subsequently used in the evaluation of pediatric health promotion outcomes and overall wellness status.

4. Results

4.1 Demographic Characteristics of Participants

A total of **420 adolescents** participated in the study. The demographic distribution included participants from urban, semi-urban, and rural communities, with balanced representation across age groups and gender categories. The majority of participants belonged to the 14–16 years age group, while female participants slightly outnumbered males. Community-wise distribution was nearly equal to facilitate meaningful comparison of

lifestyle behaviors, nutrition patterns, and health outcomes across different settings. Detailed demographic characteristics of the study population are presented in **Table 1**.

Table 1. Demographic and Community Characteristics of Adolescents (N = 420)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	12–13 Years	98	23.3
	14–16 Years	187	44.5
	17–18 Years	135	32.2
Gender	Male	204	48.6
	Female	216	51.4
Community Type	Urban	140	33.3
	Semi-Urban	140	33.3
	Rural	140	33.3
Family Income	Low	122	29.0
	Middle	214	51.0
	High	84	20.0
Parent Education	Primary School	94	22.4
	Secondary School	168	40.0
	Higher Education	158	37.6

Table 1 shows adolescents age 14 to 16 (44.5%) were the largest group of the study population. The number of female respondents was 51.4% and males were about 48.6%. A sampling design provided equal representation in the study from urban, semi-urban and rural communities. Over half of participants came from middle-income families (51.0%) while 37.6% had parents who have received higher education qualifications. These demographic factors suggest a heterogeneous study population that can be used to look at the community level differences in the psychosocial factors influencing lifestyles, nutrition, and pediatric health promotion outcomes.

4. Results

4.1 Sociodemographic Characteristics of Participants

A total of 420 adolescents aged 12–18 years participated in the study. The sample consisted of individuals from urban, semi-urban and rural areas equally. The 14–15 age group had the highest percentage of participants. There were more women than men participants. The majority of the adolescents involved were in households with moderate incomes and a significant portion had parents with secondary and above education. Table 1 shows the sociodemographic data of the study population.

Table 1. Sociodemographic Characteristics of Adolescents Participating in the Study (N = 420)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	12–13 Years	132	31.4
	14–15 Years	148	35.2
	16–18 Years	140	33.4
Gender	Male	204	48.6
	Female	216	51.4
Community Type	Urban	140	33.3
	Semi-Urban	140	33.3
	Rural	140	33.3
Family Income	Low	118	28.1
	Middle	219	52.1
	High	83	19.8
Parent Education	Primary School	92	21.9
	Secondary School	171	40.7
	Higher Education	157	37.4

The age group of 14-16 years adolescents represented the highest percentage of the study sample (44.5%) (Table 1). The percentage of female participants in the study amounted to 51.4% and male participants 48.6%. The sampling design ensured representation of both urban, semi-urban and rural areas. The majority of participants were from middle income households (51.0%), and 37.6% had parents with higher education qualifications. These demographic features suggested that a varied study population was present that could represent the study of community-level differences in lifestyle behaviors, nutrition patterns, and pediatric health promotion outcomes.

4.2 Lifestyle Behaviors and Nutrition Patterns

The lifestyle behaviors and nutrition habits were different in the 3 community settings. More screen time was reported for urban adolescents, and faster-food consumption was reported for rural adolescents whereas lower dietary diversity and less intake of fruits were reported for rural adolescents. Most of the behavioral and nutritional measures were intermediate in the semi-urban groups. Compared with urban adolescents, physical activity levels were relatively high amongst rural adolescents, and urban adolescents reported shorter sleep duration. Table 2 shows the differences in lifestyle and nutritional characteristics between communities.

Table 2. Lifestyle and Nutrition Characteristics Across Communities (Mean ± SD)

Variable	Urban (n=140)	Semi-Urban (n=140)	Rural (n=140)	p-value
Physical Activity (min/day)	54.8 ± 18.2	62.4 ± 19.5	71.6 ± 20.1	<0.001
Screen Time (hours/day)	5.1 ± 1.4	4.2 ± 1.3	3.5 ± 1.2	<0.001
Sleep Duration (hours/day)	7.0 ± 0.9	7.4 ± 1.0	7.8 ± 1.1	0.002
Fruit Intake (servings/day)	2.8 ± 1.0	2.5 ± 0.9	2.2 ± 0.8	0.011
Vegetable Intake (servings/day)	3.1 ± 1.1	3.0 ± 1.0	2.8 ± 0.9	0.048
Fast-Food Consumption (times/week)	3.6 ± 1.5	2.8 ± 1.3	1.9 ± 1.1	<0.001
Sugary Beverage Intake (times/week)	4.1 ± 1.8	3.5 ± 1.5	2.7 ± 1.2	<0.001
Dietary Diversity Score (0–10)	7.6 ± 1.3	7.1 ± 1.2	6.5 ± 1.1	<0.001

Table 2 demonstrates that there were significant variations between communities for all of the lifestyle and nutrition variables. There was a significant difference between the physical activity level (71.6 ± 20.1 min/day) and sleep duration (7.8 ± 1.1 h/day) among rural adolescents, whereas urban adolescents' screen exposure time (5.1 ± 1.4 h/day), fast-food consumption (3.6 ± 1.5 times/week) and sugary beverage intake (4.1 ± 1.8 times/week) were significantly greater. The highest dietary diversity scores were recorded for urban participants and lowest scores were recorded for rural participants. The results of the present study suggest that community context is important in influencing adolescent life style habits and nutrition.

4.3 Association Between Lifestyle Factors and Pediatric Health Outcomes

Pearson correlation was conducted to analyze the relationship between lifestyle behaviors, nutritional pattern and the health outcomes of children. Results showed strong positive relationships between the healthy lifestyle indicators and overall health promotion outcomes. Moderate to strong positive correlations also occurred for physical activity, dietary diversity, and length of sleep with the Pediatric Health Promotion Index (PHPI) while negative correlations were found for screens and fast food consumption. These results suggest associations between having better health behaviours and better health status as well as health promotion results among adolescents. The detailed correlation coefficient are shown in Table 3.

Table 3. Correlation Analysis Between Lifestyle, Nutrition, and Health Outcomes

Variable	PHPI (r)	Wellness Score (r)	p-value
Physical Activity Duration	0.71	0.68	<0.001
Screen Exposure Time	-0.63	-0.59	<0.001
Sleep Duration	0.58	0.61	<0.001
Fruit Intake	0.65	0.60	<0.001
Vegetable Intake	0.62	0.57	<0.001
Fast-Food Consumption	-0.56	-0.52	<0.001
Sugary Beverage Intake	-0.49	-0.46	<0.001

Dietary Diversity Score	0.74	0.70	<0.001
BMI-for-Age Percentile	-0.32	-0.28	0.004

The highest positive correlation with the Pediatric Health Promotion Index was with Dietary Diversity Score (r = 0.74), followed by Physical Activity Duration (r = 0.71) and Fruit Intake (r = 0.65) as seen in Table 3. Otherwise, there was notable negative relationships between Screen Exposure Time and health promotion outcomes (r = -0.63) among the associations among the variables, and between Fast-Food Consumption and health promotion outcomes (r = -0.56). There were similar trends for the Wellness Score, which underscores the positive role of healthier diet practices, regular physical activity and adequate sleep in supporting adolescent health and the negative role of sedentary behaviors and unhealthy dietary choices in terms of long-term pediatric health. The results help substantiate the conceptual model proposed and underscore the need for combined lifestyle and nutrition interventions for promoting adolescent health.

4.4 Predictors of Long-Term Pediatric Health Promotion Outcomes

To identify which adolescent-related factors were most important for predicting long-term outcomes of health promotion among adolescents, multiple linear regression was used. Factors Statistically significant in the correlation analysis were made part of a regression equation. The results revealed that dietary diversity score, physical activity duration, screen exposure time, and sleep duration were significant predictors of the Pediatric Health Promotion Index (PHPI). Dietary diversity was the most important positive predictor followed by physical activity, while screen exposure time was the most significant negative predictor on the health promotion outcomes. Results of the detailed regression are shown in Table 4.

Table 4. Multiple Regression Analysis of Significant Predictors of Pediatric Health Promotion Outcomes

Predictor Variable	Standardized β	Standard Error	t-value	p-value
Dietary Diversity Score	0.38	0.041	9.27	<0.001
Physical Activity Duration	0.34	0.038	8.94	<0.001
Screen Exposure Time	-0.29	0.045	-6.44	<0.001
Sleep Duration	0.22	0.052	4.23	<0.001
Fruit Intake	0.18	0.047	3.83	<0.001
Fast-Food Consumption	-0.16	0.049	-3.27	0.001

The regression model accounted for about 67% of the variance in pediatric health promotion outcomes as seen in Table 4. DDS (β = 0.38) was the most significant and positive predictor, suggesting that the higher the diversity of dietary pattern, the higher was the adolescent's health promotion score. The total duration of physical activity also had a significant positive association with health outcomes (β = 0.34). Conversely, screen exposure time (β = -0.29) and fast-food consumption (β = -0.16) had a negative association with the PHPI score, indicating that the sedentary lifestyle and less good nutritional habits of the adolescents had a negative effect on health.

The difference among community-level outcomes for pediatric health promotion is shown in Figure 2. As seen in the figure, adolescents from rural settings had a mean score of 79.3(±7.2) followed by those in semi-urban communities with a score of 74.6(±7.9) and the lowest score belonging to adolescents in urban communities with a score of 69.8(±8.4). The results of the one-way ANOVA revealed that there was a statistically significant difference between the three community groups ($F = 18.42$, $p < 0.001$). The results of higher PHPI values among rural adolescents corroborate the results reported in Table 2, which shows that physical activity level, screen time, and health-related behaviors were higher for rural adolescents. These findings also reinforce the regression findings shown in Table 4, where the lifestyle and nutritional factors are shown to be significant factors in long-term outcomes for pediatrics health promotion.

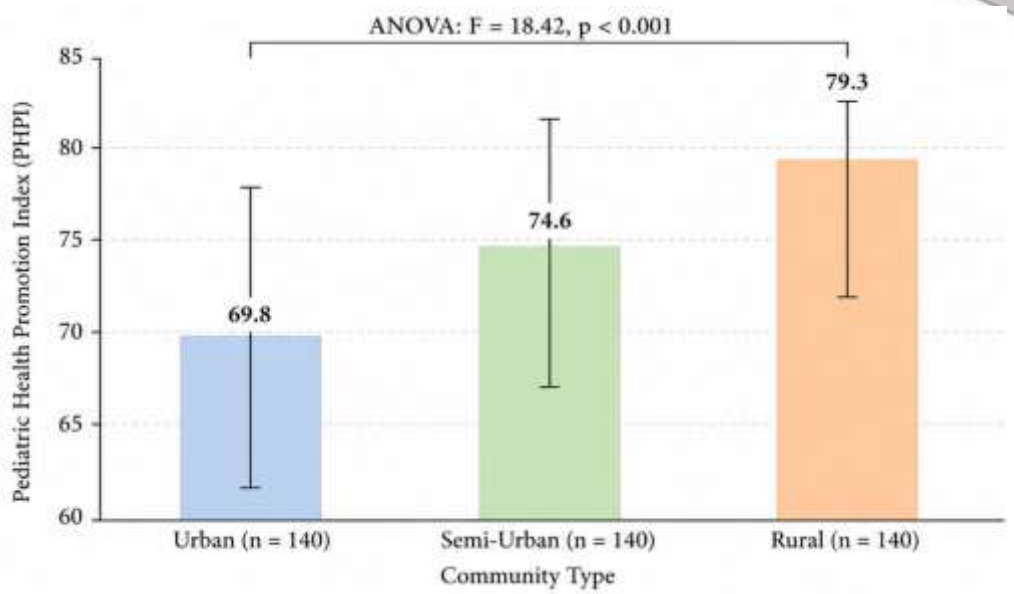

Figure 2. Community-Wise Comparison of Pediatric Health Promotion Index Scores

Standard deviation (SD) is shown as error bars. The results of one way ANOVA showed that the differences between urban communities, semi-urban communities and rural communities were significant ($F = 18.42$, $p < 0.001$).

5. Discussion

This study compared adolescent's long-term health promotion outcomes with lifestyle behaviors and nutrition patterns in the urban, semi-urban, and rural community. The results indicated that the adoption of a healthy lifestyle and healthy diet was significantly related with Pediatric Health Promotion Index (PHPI) score. A diversity of foods and exercise were associated with the best health outcomes, while too much screen time and too many fast foods were associated with adverse health outcomes.

Lifestyle behaviors were important in health promotion for adolescents. Attainment of wellness and health promotion outcomes was found to be associated with higher levels of physical activity and sufficient sleep duration, and with longer durations of screen time, poorer indicators of health. These findings point to the need for promoting active lifestyles and healthy daily habits in adolescence.

The nutrition patterns also had a very strong impact on health outcomes. Adolescents who reported higher dietary diversity and higher frequency of eating fruits and vegetables scores higher on the health promotion scale. However, regular frequent fast food consumption was linked to poor health status, highlighting the need for balanced nutrition for proper growth and development.

There was some variation seen at the community level, with adolescents residing in rural areas having the highest PHPI scores followed by those living in semi-urban and urban areas. The differences may be related to the lifestyle opportunities, diet and environmental factors that communities experience.

Results are in line with previous research that found positive impacts of physical activity, healthy dietary choices and adequate sleep on the well-being of adolescents. In the public health context, the findings highlight the need to support the adoption of school- and community-based policies and programmes that promote healthy eating, physical activity, decreased screen time, and better sleep, in the schools.

This study's strengths include a relatively wide representation of adolescents from a variety of community settings and the utilisation of the Pediatric Health Promotion Index as an overall health measure. The cross sectional design does not allow for causal interpretation, however, and self-reported measures may have recall bias. Longitudinal study of the long-term effect of lifestyle and nutrition behaviors on the health outcomes of adolescents is recommended for further studies.

6. Community-Based Pediatric Health Promotion Framework

The present study outcomes were used to create a comprehensive Community Based Pediatric Health Promotion Framework that will encourage healthy lifestyle behaviors and promote long term health outcomes within adolescents. The outlined framework starts with key community inputs that are represented in figure 3, such as community resources, schools and education related organisations, healthcare services, family support, and policies. These resources are essential to the environment needed to support healthy behaviors among youth.

This framework focuses on three key lifestyle areas: Physical Activity, Screen Management and Healthy Sleep. Physical activity, decreased sedentary time, good screen time, and sufficient sleep are recognized as important factors of adolescent wellness. At the same time, the nutrition component emphasizes eating a variety of foods, eating healthy foods, drinking fluids properly, and minimizing fast-food consumption. These lifestyle and nutrition factors are linked to beneficial health outcomes, such as better physical health, health growth and development, better mental health, lower risk of chronic disease, and better Pediatric Health Promotion Index (PHPI).

The Community Based Support System is one of the key elements of the framework, covering health education and awareness programmes, school health initiatives, community engagement, parental involvement and policy implementation and monitoring. These inter-related strategies will help to enable behavioral change, and support healthy lifestyle habits across the entire adolescent period.

The goal of the framework is to have long-term effects, such as healthier adolescents, productive adults, more vibrant communities, lower health care expenses, and long-term sustainable population health. The feedback loop embedded within the framework underscores the ongoing relationship between community support systems and health outcomes to support the successful implementation of health promotion programs that can be reinforced and maintained in the future.

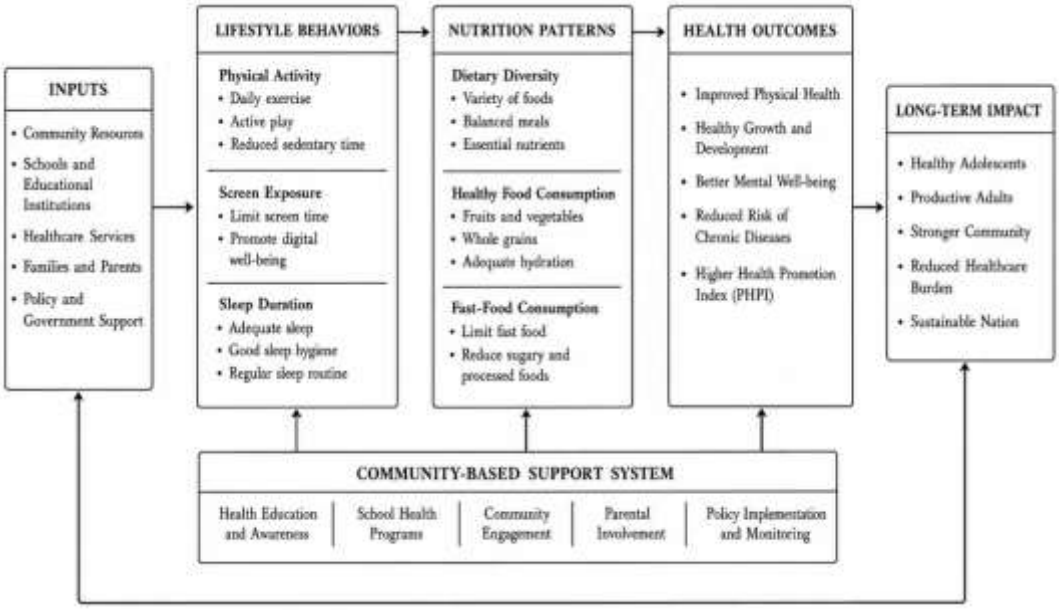

Figure 3. Proposed Community-Based Pediatric Health Promotion Framework.

The framework shows the relationships between community resources, lifestyle behaviors, nutrition patterns, health outcomes, long-term effects, and integrated community-based interventions, along with the continuous feedback mechanisms.

7. Conclusion

This study used a survey questionnaire to explore the connection between lifestyle behaviors, nutrition habits and long-term pediatric health promotion outcomes in semi-urban, urban, and rural adolescents. The results showed that a healthier diet, more physical activity, sufficient sleep time and less screen time were significantly associated with better Pediatric Health Promotion Index (PHPI) scores and overall wellness. Adolescent dietary diversity, physical activity, and inadequate use of social media or frequent eating of fast food were the most significant postive and negative predictors of health promotion outcomes, respectively. Other differences were noted within the community — the comparative high scores for health promotion among the rural adolescents compared to their urban peers.

The findings suggest that it is crucial to take a holistic perspective on adolescent health promotion, focusing on promoting healthy lifestyle behaviors, healthy nutrition patterns and environmental factors at the same time. The proposed Community Based Pediatric Health Promotion Framework is a feasible approach to supporting development of healthy behaviors, mental health, and prevention of future disease, and sustainable health behaviors in adolescence.

Adolescents should be exposed to nutrition education programs, encouraged to engage in regular physical activity, to sleep a healthy amount, and to limit excessive screen time, in a preventative public health framework where nutrition education, physical activity, and healthy sleep patterns are combined as part of a school's nutrition policy and programs, and where nutrition education is delivered in collaboration with health care providers and families and through connection to community organizations. These interventions can help ensure better youth health, and decrease the lifetime disease burden from non-communicable diseases.

While the study offers important insights into health promotion for adolescents, further research is needed to explore long-term health patterns and causal relationships using longitudinal design and larger population samples. Additional research can also assess the impact of community-based intervention programmes and improve health promotion indices with further application to a variety of groups.

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