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Gender Differences in Nutritional Status Among Adolescents Living with Family in Selected Slums of Dhaka, Bangladesh: A Mixed-Method Study

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Abstract

Introduction: Nutritional vulnerability of adolescents living in slums is more compare to general adolescents. Adolescent girls are disproportionately impacted by nutritional deficiency due to gender norms, many adolescent boys are malnourished as well. This study sought to assess gender differences in nutritional status among adolescents living with family in selected slums of Bangladesh. **Methods:** The study used cross-sectional design with mixed method approach. Male and female adolescents between 10 to 19 years living in the Bauniabadh slum and 'Ta' Block Jhil Par slum of Dhaka were study population. Quantitative data was collected through pre-tested structured Bangla questionnaire by household survey of 115 adolescents. Qualitative interviews were sought through 12 In-depth interviews. BMI was categorized and 24-hour dietary recall was used to obtain dietary information by dietary diversity score. **Results:** Around 40.0% male adolescents and 46.6% female adolescents were underweight. Approximately 5% male adolescents and 3.4% female adolescents were overweight. Almost 67% male adolescents and 63.8% female adolescents had lowest dietary diversity score. One-fourth of male adolescents and 36.2% female adolescents had medium dietary diversity Score. There is observed association between sex of respondents and eating vegetables, and eating fish ($p<0.05$). Dietary behavior and eating more foods for female adolescents had significant observed association with sex of respondents ($p<0.05$). The qualitative result revealed that females were expected to learn cooking since they had to feed other members of her in laws house. Females made food sacrifices so that other family members could eat more. **Conclusion:** There were gender differences in nutritional status, dietary behaviour and nutritional knowledge among male and female adolescents living with family in selected slums of Dhaka, Bangladesh.

Keywords: Adolescents, Bangladesh, Dietary Behaviour, Gender, Nutrition

1. Introduction

Adolescence is a transitional period of development from childhood to adulthood characterized by rapid physical, mental and social changes which have an impact on a person's eventual dietary habits and nutritional status (Kahssay *et al.*, 2020). There are about 1.2 billion adolescents in the world among them 19% suffer from major nutritional deficiencies, who resides in developing countries (Kabir *et al.*, 2016). During adolescence nutritional insufficiency leads to poor nutritional status such as underweight, stunting, wasting (Ahmad *et al.*, 2020). Globally, girls continue to be twice as likely to suffer from all types of malnutrition compared to their male peers (Nasreddine, 2020). Adolescent boys also suffer from a high burden of malnutrition particularly thinness while there is inadequate nutritional data on them (GAIN, 2018). Poor nutritional status of adolescents in early life reduces learning abilities, increases reproductive and maternal adverse health effects and reduces productivity (Oniang'o *et al.*, 2020). In South Asia, Adolescent girls have a low social position, and low birth weight children born to undernourished adolescent mothers pass on their malnutrition to the next generation (Sen & Hook, 2012).

Malnutrition is a major public health concern in Bangladesh as the prevalence of malnutrition is higher in female than male (Blum *et al.*, 2019). There are about 36 million adolescents in Bangladesh comprised of 22% of the population (UNICEF, 2018). The prevalence of adolescent's stunting is 36% and low body mass index (BMI) is 50% in Bangladesh (Kabir *et al.*, 2016). There are 13.7 million adolescent girls among them the prevalence of Low BMI is 50% (Ahmed *et al.*, 2020). About 31% of adolescent girls (15–19 years old) are undernourished (BMI<18.5) in Bangladesh (Leroy *et al.*, 2018). Among ever-married adolescent girls, 4% are underweight and around one-in-ten unmarried adolescents are underweight (NIPORT, 2020).

Lack of dietary diversity is particularly an important concern in adolescent nutrition (Kaur *et al.*, 2020). Studies conducted in low income developing countries, revealed girls have lower intakes of nutritious foods such as meats, eggs, milk, pulses, fruits, and vegetables and a greater risk for micronutrient deficiencies compared to boys (Nasreddine, 2020). Adolescent females are at least twice as likely as boys to go to bed hungry, skip meals, and eat smaller meals as a coping strategy during food insecurity (GAIN, 2018).

The nutritional needs of Bangladeshi adolescent girls for physical maturation and menstruation are disproportionately impacted by gendered cultural norms (GAIN, 2018). Due to the parents' preference for sons, there is discrimination against daughters in intra-household food allocation, resulting in undernutrition (Christian & Smith, 2018). Gender norms between female and male (roles and responsibilities) have an impact on food attainment, taking decisions about intrahousehold food distribution, food consumption pattern and differences related to food intake (Blum *et al.*, 2019).

There are very limited studies on gender perspective of adolescent nutrition in Bangladesh. Adolescents of the slum area are nutritionally more vulnerable because of poverty, lack of knowledge about the long-term consequences of adolescent malnutrition, poor housing conditions, and inadequate quality and quantity of food (Alam *et al.*, 2018). Nutritional vulnerability of adolescents living in slum areas is more, compare to general adolescents. Addressing gender dimensions is effective way to tackle malnutrition. The way towards improved nutrition for adolescents should be gender equitable process.

2. Method

In order to conduct a thorough study of the slums in Pallabi thana of Mirpur, Dhaka, a cross-sectional mixed method research approach was utilized. Specifically, Bauniabadh and the "Ta" block of Jhil Par were purposely selected as our sample size from the 107 slums under the authority of Dhaka North City Corporation. Bauniabadh slum is located in Pallabi Thana of Dhaka district, ward number 5, DNCC zone 2, and is divided into 5 blocks: A, B, C, D, and E. Meanwhile, 'Ta' Block Jhil par is situated in Pallabi Thana of Dhaka district, ward number 6, DNCC zone 2. Although both impoverished areas are about two kilometers apart, they were both chosen as important study locations. Participants were selected from both slums using a simple random sampling technique and household list. This list was utilized to develop an outline, and participants were chosen by lottery method. Both quantitative and qualitative methods were utilized in order to gather comprehensive data.

The quantitative study enlisted a total of 115 male and female adolescents. Participants were selected based on the age between 10 to 19 years, voluntary participation in the study, parent/guardian's informed written consent and assent. Pre-tested semi-structured Bangla questionnaire was used for data collection. Standard height was measured with measuring tape to the nearest of centimeters and weight was measured on a weighing machine in kilogram. BMI was calculated as a person's weight in kilograms divided by the square of the person's height in meters (kg/m²) and BMI was categorized into 4 groups- Underweight (Below 18.5), Normal (18.5-24.9), Overweight (25.0-29.9), Obesity (Above 30) (WHO 2019).

24-hour dietary recall was used to obtain dietary information by dietary diversity score. The score was calculated by using the Guidelines for Measuring Individual Dietary Diversity Score (DDS) for adolescents (Alam, 2018). The DDS was used as a proxy of household dietary diversity, such that the higher the DDS, the higher the dietary diversity. Based on food items consumed in the last 24 hours, respondents were assigned the number of food groups they consumed, ranging from 0 to 9. Dietary Diversity Scores (DDS) were calculated using these 9 food group indicators. The 9 food groups included starchy staples (e.g., rice, etc.), legumes and nuts, dairy, organ meats, eggs, flesh foods (meat, fish, or poultry), vitamin A-rich dark green leafy vegetables, other vitamin A rich fruits and vegetables, and other fruits and vegetables. DDSs were calculated by summing the number of food groups consumed by the respondents on a day. Individual dietary diversity scores were categorized into 3 groups which was based on the distribution of 9 food groups, ≤ 3 food groups as lowest dietary diversity, 4-5 food groups as medium dietary diversity and ≥ 6 as high dietary diversity.

A database in SPSS version 23 (Chicago, IL, USA) was developed according to the questionnaire. Data regarding all question was entered in the developed data base. Descriptive statistics, bivariate statistics were updated. Data related to Dietary Diversity score was calculated by summing of nine dietary diversity indicators. This score was categorized as per the guideline and presented by frequency distribution, appropriate chart and table. Chi-square test was used to analyze the association. The significance p-value of the associations was analyzed.

For our In-depth interview, we interviewed 3 male adolescents, 3 female adolescents, 3 fathers and 3 mothers. These participants were purposively sampled based on our inclusion criteria. Notes were taken during the interview and interviews were recorded with voice recorders and then transcribed. Data were coded manually. All transcripts were reviewed and themes were developed based on analysis plan and thematic analysis was done.

3. Results

3.1. Quantitative results

3.1.1. Sociodemographic characteristics of the participants

Among 115 adolescents, 49.6% are male adolescents and 50.4% are female adolescents. Majority of adolescents (47.0%) were aged between 14-16 years and 33.0% were aged between 10-13 years. Around 70.4% adolescents were in secondary and 16.5% adolescents were in primary level of education. About 29.6% and 40.9% adolescents' fathers and mothers had primary level of education respectively. Approximate 69.6% adolescents' fathers were self-employed and 67.0% adolescents' mothers were housewife. Almost 54.8% respondents had 5-7 family members and 36.5% adolescents had ≤ 4 family members.

3.1.2. Nutritional status of the respondents

Table 1 shows that 40.4% male adolescents and 46.6% female adolescents were underweight. About 5.3% male adolescents and 3.4% female adolescents were overweight. Only 1.7% female and no male adolescents were obese.

Table 1: Distribution of BMI category among male and female respondents (n=115)

BMI Category (kg/m ²)	Male (n=57) n (%)	Female (n=58) n (%)
Underweight (<18.5)	23 (40.4)	27 (46.6)

Normal (18.5-24.9)	31 (54.4)	27 (48.3)
Overweight (25.0-29.9)	3 (5.3)	2 (3.4)
Obesity (≥ 30)	0 (0)	1 (1.7)

Table 2 shows 66.7% male adolescents and 63.8% female respondents had lowest DDS. About 33.3% male adolescents and 36.2% female adolescents had medium DDS.

Table 2: Distribution of Dietary Diversity Score (DDS) among male and female respondents (n=115)

Dietary Diversity Score	Male (n=57) n (%)	Female (n=58) n (%)
Lowest DDS (≤ 3 food groups)	38 (66.7)	37 (63.8)
Medium DDS (4 and 5 food groups)	19 (33.3)	21 (36.2)

Table 3 shows that 100% male and 100% female adolescents consumed starchy staples. About 73.7% male and 77.6% female adolescents consumed meat and fish, 43.9% male and 36.2% female adolescents consumed other vitamin A rich fruits and vegetables (e.g. tomato, onion, eggplant, wild fruits, locally available vegetables), 57.9% male and 53.4% female adolescents consumed legumes, nuts and seeds, 10.5% male and 13.8% female adolescents consumed dark green leafy vegetables, only 3.4% female and no male adolescents consumed vitamin A rich fruits and vegetables (pumpkin, carrot, squash, or sweet potato that are orange inside, red sweet pepper), 28.1% male and 34.5% female adolescents consumed eggs, 5.3% male and 3.4% female adolescents consumed milk and milk-products.

Table 3: Different food groups consuming in 24 hours by male and female respondents (n=115)

Food groups	Male (n=57) n (%)	Female (n=57) n (%)
Starchy staples	57 (100)	58 (100)
Dark green leafy vegetables	6 (10.5)	8 (13.8)
Vitamin A rich fruits and vegetables	0 (0)	2 (3.4)
Other vitamin A rich fruits and vegetables	25 (43.9)	21 (36.2)
Organ meat	1 (1.8)	0 (0.0)
Meat and fish	42 (73.7)	45 (77.6)
Eggs	16 (28.1)	20 (34.5)
Legumes, nuts and seeds	33 (57.9)	31 (53.4)
Milk and milk products	3 (5.3)	2 (3.4)

Table 4 shows that 67.4% female and 32.6% male adolescents gave their opinion to eat vegetables daily, respectively. 61.5% female and 38.5% male responded to eating fish 3 or 4 times per week. About 22.6%, 38.3%, and 24.3% of the adolescents picked the correct food group to see the knowledge about carbohydrate, protein and fiber rich food. Surprisingly, most of the adolescents didn't know the right food according to carbohydrate (60.0%), protein (47.0%) and fiber rich food (69.9%). Almost 54.2% female and 45.8% male adolescents suggested eating vegetables, fruits, milk for female adolescents. About 61.4% female and 38.6% male adolescents agreed to eat more food for female adolescents. So knowledge level of female respondents is significantly higher

than male adolescents. There is association between sex respondents with eating vegetables and eating fish in a week where the respective p-value is smaller than 0.05 at 5% level of significance. Also, food behavior and eating more food for female adolescents have significant association with sex of the respondents.

Table 4: Nutrition related knowledge among male and female respondents (n=115)

Variables	Male n (%)	Female n (%)	p-value
Minimum fruits intake per week			
≤ 3 days	17(47.2)	19 (52.8)	0.984
≥ 4 days	13 (50.0)	13 (50.0)	
Daily	22 (50.0)	22 (50.0)	
Don't know	5 (55.6)	4 (44.4)	
Minimum vegetables intake per week			
≤ 4 days	28 (68.3)	13 (31.7)	0.004
≥ 5 days	9 (42.9)	12 (57.1)	
Daily	15 (32.6)	31 (67.4)	
Don't know	5 (71.4)	2 (28.6)	
Minimum fish intake per week			
1 or 2 times in a week	28 (68.3)	14 (33.3)	0.015
3 or 4 times in a week	25 (38.5)	40 (61.5)	
Daily	0 (0.0)	1 (100)	
Don't know	4 (57.1)	3 (42.9)	
Carbohydrate rich food			
Rice, bread, potato	14 (53.8)	12 (46.2)	0.462
Fish, meat, egg, pulse	4 (44.4)	5 (55.6)	
Vegetables, fruits	3 (27.3)	8 (72.7)	
Don't know	36 (52.2)	33 (47.8)	
Protein rich food			
Rice, bread, potato	1 (20.0)	4 (80.0)	0.298
Fish, meat, egg, pulse	22 (50.0)	22 (50.0)	
Vegetables, fruits	4 (33.3)	8 (66.7)	
Don't know	30 (55.6)	24 (44.4)	
Fiber rich food			
Rice, bread, potato	0 (0.0)	2 (100)	0.239
Fish, meat, egg, pulse	4 (80.0)	1 (20.0)	
Vegetables, fruits	12 (42.9)	16 (57.1)	
Don't know	41 (51.3)	39 (48.8)	
Foods that male adolescents should eat			
Rice, bread, potato	8 (61.5)	5 (38.5)	0.310
Pulse, meat, egg	9 (69.2)	4 (30.8)	
Vegetables, milk, fruits	38 (44.7)	47 (55.3)	
Don't know	2 (50.0)	2 (50.0)	
Foods that female adolescents should eat			
Rice, bread, potato	6 (54.5)	5 (45.5)	0.004
Pulse, meat, egg	6 (31.6)	13 (68.4)	
Vegetables, milk, fruits	33 (45.8)	39 (54.2)	
Don't know	12 (92.3)	1 (7.7)	
More foods required for female adolescents			
Yes	32 (38.6)	51 (61.4)	0.001
No	20 (76.9)	6 (23.1)	
Don't know	5 (83.3)	1 (16.7)	
More foods required for male adolescents			
Yes	43 (47.8)	47 (52.2)	0.172
No	11 (68.8)	5 (31.3)	
Don't know	3 (33.3)	6 (66.7)	

3.2. Qualitative results

This section provides details about in depth interviews (IDIs) of male adolescents, female adolescents, fathers and mothers. Three themes were developed in English (gender norms and nutritional knowledge, gender norms and food management and challenges to healthy diet).

3.2.1. Gender norms and nutritional knowledge

Adolescents and their parents think that nutritious food is food that is healthy for the body, gives energy to the body so that they can complete the activities of everyday life. Vegetables, fish, meat and eggs are considered nutritious foods by them. Vegetables, on the other hand, are known to them as the most nutritious food. They believe that eating more vegetables will improve their health and provide them with more vitamins. Adolescents said that their families' assistance helped to make healthy food choices; parents gave them food recommendations and encouraged them to cook. Foods including fruit, vegetables and dairy products were the subject of parental guidance. Parents also encouraged their children to eat a variety of foods. Family members also emphasized the necessity of eating nutritious, regular meals in order to avoid sickness, and encouraged adolescents to eat foods prepared at home.

"I learn these things in books. Then my mother claims that eating more of these vegetables at mealtime will improve your health. My bodily structure will be in good shape and everything will be in place. Following my mother's advice, I believe that if I eat these foods, my health will improve and I will be able to maintain a reasonable level of fitness." (19 years, female adolescent)

"Nutritious foods are those foods that strengthen the body, improve health and boost immunity. Such as rice, fish, meat, colorful vegetables, pulses, milk, eggs. There are nutrients in the food that you eat in general but you have to change the type of food and eat it." (35 years, mother)

3.2.2. Gender norms and food management

When there is less food at home, mothers tend to eat later so that their children can get enough food to eat. When evaluating intrahousehold food allocation decisions, gender has proven to be an important criterion. Food insufficiency in the home requires adjustments in meal quality and frequency. Gender norms dictate that women have lower meal portions and make food sacrifices so that other family members can eat more.

"My mother controls the family. Her family and children are her first priorities. When her children eat, her tummy fills up. When her husband eats, her tummy fills up. In that scenario, my mother makes a sacrifice." (17 years, male adolescent)

Female adolescents think their fathers need to eat first because their fathers work all day.

"My father works all day. If he does not eat first, he won't get energy. I stay at home." (16 years, female adolescent)

Parents believe they need to learn cooking because they will have to feed the members of her in laws house.

"Why do you need to teach this? In addition to her studies, she should also learn to cook with her mother. She should be able to cook and feed her mother-in-law when we arrange her marriage. So her mother is teaching her" (42 years, father)

When asked about hurdles to healthy diet, participants indicated a lack of financial resources to purchase food. Parents often cannot provide adequate nutritious food to their children due to financial constraints. Currently, their financial situation has become more fragile due to Covid pandemic.

"We should eat the same amount of food as our two brothers and sisters. But normally it is not possible for us. Because we are middle-class family. So many things of the middle-class family have to be accepted with a smile. So we can feed my sister but we can't feed ourselves." (19 years, male adolescent)

"Dietary pattern was not good at all before pandemic, but it was fine. The condition of nutrition has been a little weak since Corona. We feel poor here, everyone is poor. There is very little middle-class family. Since there is

less income in poor areas, where is the food from? Having three meals a day is very difficult. For this reason, she thinks that the issue of nutrition is less than it used to be." (35 years, mother)

"Every day I think I will feed them a little bit of nutritious food. My son and daughter will be fine. But I can't do much. I want to, but I can't. " (35 years, mother)

Parents stated that their children don't want to eat vegetables or milk because they don't like it.

"They eat meat, eggs. Consumption of milk is less. Eating vegetables is much less, they don't like vegetables. I mean, they don't want to eat even if i cook. " (35 years, mother)

3.2.3. Challenges to healthy diet

When asked about hurdles to healthy diet, participants indicated a lack of financial resources to purchase food. Parents often cannot provide adequate nutritious food to their children due to financial constraints. Currently, their financial situation has become more fragile due to Covid pandemic.

"We should eat the same amount of food as our two brother and sister. But normally it is not possible by us. Because we are middle class family. So many things of the middle class family have to be accepted with a smile. So we can feed my sister but we can't feed ourselves. " (19 years, male adolescent)

"Every day I think I will feed them a little bit of nutritious food. My son and daughter will be fine. But I can't do much. I want to, but I can't. " (35 years, mother)

Parents say their children don't want to eat vegetables or milk because they don't like it.

"They eat meat, eggs. Consumption of milk is less. Eating vegetables is much less, they don't like vegetables. I mean, they don't want to eat even if i cook. " (35 years, mother)

Dietary behaviours are influenced by a family's socioeconomic condition, socio-cultural norms, gender norms and food preferences.

4. Discussion

This study observed one of the most notable findings of our study was among 115 respondents 51.3% of respondents had normal BMI, which is highest among surveyed respondents. Almost 43.5% adolescents were underweight, on the other side, 4.3% adolescents were overweight and 0.9% adolescents had obesity. More of the female adolescents (46.6%) were underweight compared to male adolescents (40.4%), but the difference was not significant. In contrast to our study, some other studies showed similar result of nutritional status. An almost similar study (Kabir et al., 2010) was carried out among 82 adolescents found that 39% of adolescents were underweight, 69.8 % were normal and 1.2% were overweight.

A similar study (Verma *et al.*, 2020) was conducted in India among school going male and female adolescents found that majority of adolescents (58.8%) were underweight. There were gender-based differences in the nutritional status among male and female adolescents. More of the female adolescents (63.2%) were underweight compared to male adolescents (53.1%).

In our study, the micronutrient intake adequacy of male and female adolescents was less because the majority (100%) of adolescents ate starchy staples. Starchy staples (mostly white rice), which are deficient in micronutrients (Arsenault et al. 2013). We have seen that the majority of individuals eat rice, that many have poor financial conditions and that many have good financial and educational conditions, but when we ask, many people can reply yes without even consuming that food, thus socially desirable information may arise.

Around 73.7% male and 77.6% female adolescents consumed meat (mainly chicken) and fish. 43.9% male and 36.2% female adolescents consumed other vitamin A rich fruits and vegetables (e.g. tomato, onion, eggplant, wild fruits, locally available vegetables). These findings are similar to Bangladesh Adolescent Health and Well-being Survey 2019-2020 where 24% female adolescents had consumed vitamin A-rich foods in 24 hours preceding the survey. The proportion was slightly higher (29%) among the male adolescents. 57.9% male and 53.4% female adolescents consumed legumes, nuts and seeds, 10.5% male and 13.8% female adolescents consumed dark green leafy vegetables, only 3.4% female and no male adolescents consumed vitamin A rich fruits and vegetables

(pumpkin, carrot, squash, or sweet potato that are orange inside, red sweet pepper), 28.1% male and 34.5% female respondents consumed eggs, 5.3% male and 3.4% female adolescents consumed milk and milk-products. Only 1.8% male and no female adolescent consumed organ meat. Poor dietary diversity has been associated with low food expenditures, particularly non-starchy foods that are nutrient-dense but expensive, such as organ meat, eggs, and dairy products (Thorne-lyman *et al.* 2010).

In our qualitative study we have observed that when there is less food at home, mothers tend to eat later so that their children can get enough food to eat. Gender has been shown to be an essential factor in assessing intrahousehold food allocation decisions. According to gender stereotypes, women serve themselves smaller quantities at meals and give up certain foods so that their male family members can eat more. Another similar study conducted among female adolescents in some slums of Dhaka and some rural areas of Bangladesh by Blum *et al.*, 2019 showed that how gender norms impact male and female roles, which in turn influence food acquisition, intrahousehold food allocation decisions, consumption habits and differences in actual food intake. Gender-based eating differences are enforced by cultural norms, which explain why females are expected to serve more and special meals to male family members and are expected to consume less during food shortages and financial struggles. In our study female adolescents think that their fathers need to eat first because their fathers work all day. A similar study conducted among female adolescents in some slums of Dhaka and some rural areas of Bangladesh by Blum *et al.*, 2019 showed that men and adolescent males were reported to be given both greater amounts and better-quality foods due to their economic roles, larger physiques and perceptions that males are more active, with boys also being preferred because they are expected to provide money and care for their parents in old age.

5. Conclusion

There are gender differences where female adolescents were more underweight than male adolescents though female had better dietary behaviour than male adolescents. Lack of dietary diversity was also prevailing in both sexes. Lowest dietary diversity is higher among male than female adolescents. There was significant association between sex with eating vegetables and eating fish. Dietary behavior and eating more foods for female adolescents had significant association with sex of the respondents. So, proper knowledge on nutrition can improve the dietary behaviour. Adolescents gathered nutritional knowledge from books and their mothers. Female adolescents are not allowed to go to the market since it is not a safe place. Female made sacrifices in food consumption so that other family members could eat more and they were expected to learn cooking since they had to feed other members of her in laws house. About challenges to healthy diet, participants indicated a lack of financial resources to purchase nutritious food.

Author Contributions: All authors have approved the submission of this paper and made substantial contributions to it. UH and FH developed the concept, and UH, FH, SSI, and TS carried out the statistical and qualitative analysis. UH, FH, and Hridi performed data curation. UH, FH, TS, NA and SSI managed data analysis and interpretation. The revisions were provided by FH, TS, Hridi, NA, BB, MA, ZR, and SSI. Each author took responsibility for the project as a whole and offered important technical substance during the drafting or editing of this paper.

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Ethical approval and consent to participate: The Institutional Review Board of Bangabandhu Sheikh Mujib Medical University officially approved this study (Reference No. BSMMU/2021/8653) and it was conducted in accordance with the Declaration of Helsinki. Each participant signed a written informed consent form that included all the information about the research, their participation rights, and the right to withdraw from the study at any time. Adolescents under the age of 18 years were requested to provide written assent, which was supported by obtaining written informed consent from the adolescent's parents and guardians.

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