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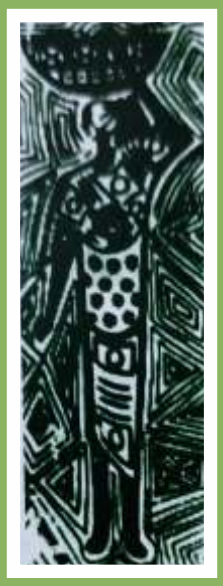

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CASE REPORT



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# Prevalence of Constipation Among Adolescent Secondary School Students in Yenagoa, Nigeria

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**Abstract**

**Background:** Constipation is one of the most common digestive system disorders in children and adolescents.

**Objective:** To determine the prevalence of constipation among adolescents in secondary schools in Yenagoa, a Nigerian city.

**Methods:** This was a cross-sectional study of children aged 10-19 attending public and private secondary schools in Yenagoa Local Government Area, Bayelsa State. Eligible adolescents were enrolled using a multistage sampling technique. A validated interviewer-administered questionnaire obtained information on sociodemographic characteristics, dietary patterns, physical activity, and bowel habits. Stool volume and character were assessed using clay models and Bristol stool charts, respectively. Constipation was determined using Rome III criteria. The anthropometric indices of subjects were also measured using standard procedures.

**Results:** A total of 935 participants were recruited (431 males and 504 females). Their mean age was 14.2±1.9 years. The prevalence of constipation was 18.8%. The risk factors for constipation at the bivariate and multivariate levels of analysis were a positive family history of constipation, attending public school, not taking watermelon, and ≥5 hours of television viewing time/day. Abdominal pain, straining at defecation, and faecal soiling of underpants were also found to be significantly associated with constipation.

**Conclusion:** Constipation was present in about one-fifth of the participants. The condition was associated with a positive family history of constipation, attending public school, not taking watermelon and ≥5 hours of television viewing time/day.

***Keywords: Adolescent, Constipation, Rome III Criteria, Stool volume, Stool character.***

## Introduction

Constipation is one of the common disorders of the digestive system in children.[1, 2] The North American Society for Paediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) defines constipation as a delay or difficulty in defaecation present for two weeks or more and sufficient to cause significant distress to the patient.[1] The Rome III diagnostic criteria [2] for functional gastrointestinal disorder (FGID) defines constipation using objective and subjective features. Constipation is classified into

organic and functional (idiopathic) types, with functional constipation (FC) accounting for 95% of cases.[1,3]

FC has a global prevalence of 0.7% to 29.6% in children and adolescents.[1,3] The prevalence of FC in Nigerian children ranges from 5.3% to 27%.[4,5] It accounts for about 3% of visits to the paediatrician and 30% of visits to the Paediatric Gastroenterologist.[6,7] Child maltreatment, dehydration, improper toilet training, and inadequate physical activity are known to contribute to FC.[1,8–10] Constipation can lead to several psycho-social, health and economic challenges in the lives of children and their families and may persist into adulthood in 30% of patients.

FC is a common problem encountered in the paediatric clinic. Despite its prevalence, it remains understudied and underreported in adolescents, even by healthcare professionals. Adolescence is a critical period of physical, emotional and social development, and FC may significantly impact quality of life, academic performance and mental health during adolescence. Untreated constipation can lead to faecal incontinence, anal fissures and chronic pain. There is a shortage of studies on FC adolescents in Yenagoa and Nigeria as a whole, hence making this study in Yenagoa significant. The study aimed to determine the prevalence and the factors predisposing to constipation in the study population.

## Methods

*Study area*

Yenagoa metropolis, the capital of Bayelsa State.

*Study design and duration*

This was a school-based, cross-sectional study that was conducted from May to July 2018.

*Study population*

The study involved adolescents aged 10 – 19 years attending secondary schools in Yenagoa metropolis, the capital of Bayelsa State.

*Sample size calculation*

Using a previously reported prevalence rate of constipation of 27% among adolescents, [5] the minimum number of children enrolled for the study at the confidence interval of 95% and an acceptable margin of error of 3% and 10% for non-responders was 935 using the formula:[11]

$$n = \frac{Z^2 \times pq}{d^2}$$

Where: n = minimum sample size; Z = Standard normal deviation corresponding to 95% confidence level =1.96; p = the prevalence of constipation among adolescents from a similar study[5] (27% or 0.27); q = 1- p; d = level of precision = 3% or 0.03.

$$n = \frac{(1.96)^2 \times 0.27(1-0.27)}{(0.03)^2}$$

$$n = 841$$

With the addition of 10% for non-responders, the minimum sample size became 935.

*Eligibility criteria*

*Inclusion criteria*

Children aged 10-19 years from both public and private secondary schools in Yenagoa LGA, who gave assent and their parents also consented.

*Exclusion criteria*

a) Use of drugs like opioids, narcotics, sedatives and antidepressants
b) Presence of gastrointestinal illnesses/surgeries such as intestinal resections.

*Sampling technique*

The study used a multistage sampling technique. The post-primary school management board and the Ministry of Education obtained a list of all the

secondary schools, which were stratified into public and private secondary schools.

*Stage 1: Selection of wards*

Ten wards were selected using simple random sampling via the closed ballot method. Two-thirds of the wards are a good representation of Yenagoa LGA.

*Stage 2: Selection of schools*

From each selected ward, a simple random sampling via a table of random numbers was used to select one public and one private secondary school (each with JSS1-3, SS1-3), totalling 20 schools. However, any school that refused to partake in the study was skipped, and the next school in line was selected.

*Stage 3: Selection of classes*

In each selected school, a table of random numbers was used to select an arm of each class (JSS1-SS3) from schools with more than one arm. Where there were no arms, the whole class was recruited.

*Stage 4: Selection of Participants*

The number of students recruited in each school was determined by the total number of students using proportionate sampling.

In the selected class arms, the list of children between 10 and 19 years old (last birthday) was obtained from the class registers with the help of the class teachers, and a process of systematic random sampling was used to select the participants.

*Study proforma and data collection*

Using a standardised, structured questionnaire used for a previous Nigerian study[5] and interviewer-administered, relevant information on sociodemographic data, family data, medical history of participants, and the education and occupation of the parents were obtained. The socioeconomic status of the participants was determined using the Oyedeji classification.[12] Details of the number of meals per day and 72-hour dietary recall were obtained (Recall bias was prevented using specific questions and memory aids like calendars). With the help of a dietician, the fibre content of different food types and the quantity eaten in the last three days were estimated using dietary fibre estimation. These allocated fibre estimates were summed up and divided by a factor of 3 to get the average daily dietary fibre intake. Participants with estimated dietary fibre intake < 26g/day were considered to have low dietary fibre intake, while those with > 31g/day were considered to have high fibre diet intake. [13]

*Stool model*

A stool model of different volumes made from clay paste by the researcher (Figure 1) was used to help the students judge the size of their stools in the preceding two days. Likewise, they were shown a consistency chart (Bristol stool chart – Figure 2) to identify their stool character in the preceding two days. The Rome III diagnostic criteria[2] which must include two or more of the following criteria: two or fewer defaecation in a week, at least one episode of faecal incontinence per week, history of retentive posturing or excessive volitional stool retention, painful or hard bowel movement, large faecal mass in the rectum and history of large diameter stools in a child with a developmental age of four years and above; was used to define functional constipation.

*Anthropometry*

The weight and height of the students were measured using standard procedures, and the values were used to determine the Body Mass Index (BMI). The BMI-for-age was calculated using the WHO references.[14]

*Data management and analysis*

Data entry and analysis were done using Statistical Package for Social Sciences (SPSS) version 20. Statistical analysis was performed using the Chi-Square test, odds ratios and the

Student's t-test as appropriate. A p-value less than 0.05 was considered statistically significant.

*Ethical consideration*

The study protocol was approved by the Bayelsa State Ministry of Education and the Ethical Committee of the Federal Medical Centre, Yenagoa, Bayelsa State. Consent was obtained from the parents ahead of the study, while assent was obtained from the students. The participants were identified by serial numbers, and confidentiality was observed for each one.

**Figure 1: Models of Stool Volumes of varying sizes made from clay paste.**

## Results

*Sociodemographic characteristics*

Nine hundred and fifty eligible adolescents were recruited for the study, but only 935 returned completed questionnaires, giving a response rate of 98%. Their ages ranged from 10 to 19 years, with a mean age of 14.2±1.9 years. There were 431 (46.1%) males and 504 (53.9%) females (male-to-female ratio of 1:1.2). There were 642 (68.7%) participants in the mid-adolescent group. Of the 935 participants, 626 (67.0%) and 309 (33.0%) were recruited from public and private schools, respectively. Socioeconomic classes of participants revealed that 461 (49.3%), 456 (48.8%) and 18(1.9%) belonged to the middle, low, and high socioeconomic classes, respectively. Most of the participants (407; 43.5%) belonged to the Ijaw tribe. (Table I)

*Anthropometric characteristics*

The anthropometric characteristics of the participants are shown in Table II. The weight of the participants ranged from 27.0 kg to 97.0 kg, with a mean of 49.4±10.43kg. The height of the participants ranged from 1.3m to 1.9m with a mean of 1.6±0.09m. The Body Mass Index (BMI) ranged from 12.4kg/m$^2$ to 38.4 kg/m$^2$ (with a mean of 19.1±3.08kg/m$^2$). The BMI-for-age ranged from -4.46 to +3.59 with a mean of -0.33± 1.16. There was a statistically significant difference between the BMI of male participants (18.60±2.79kg/m$^2$) and female participants (19.44±3.25kg/m$^2$) ($p<0.001$).

*Prevalence of constipation*

*Distribution according to Constipation Criteria*

The features observed in 447 (47.8%) participants were as follows: retentive posturing (114.4; 25.6%), painful or hard bowel movements (103; 23.0%), two or fewer defecations per week (79.1; 17.7%), at least one episode of faecal incontinence (77.3; 17.3%), and large diameter stools (73.3; 16.4%) (Figure 3).

*Prevalence of constipation - Number of Rome III Criteria per participant*

The prevalence of constipation amongst the study participants was 18.8% using the Rome III criteria (at least 2 of the criteria), as shown in

Figure 4. About half of the participants (488; 52.2%) did not present with any criterion, 271 (29%) presented with one criterion and 176 (18.8%) presented with two or more criteria.


**Figure 2: The Bristol stool chart**

*Factors associated with constipation among participants*

*Constipation and sociodemographic characteristics of participants*

The prevalence and odds of constipation among participants by sociodemographic characteristics are shown in Table III. There was a significant association between family history of constipation, school type, and occurrence of constipation. The odds of having constipation were 2.38 times higher in those with a family history of constipation than those without (OR = 2.38; 95% CI = 1.48, 3.85). Likewise, the odds of constipation were 1.73 times higher for those in public schools (OR = 1.73; CI = 1.19, 2.53) than those in private schools.

*Constipation and physical activity among the participants*

Table IV shows the relationship between physical activity and constipation in the participants. The prevalence of constipation was higher in those who did not partake in any form of exercise (20.8%) compared to those who did (18.4%), though the difference was not statistically significant (p = 0.46). Those who engaged in one hour of exercise per week had a higher prevalence of constipation (20.6%) than those who engaged in several hours, though the difference was not statistically significant (p = 2.39). Participants who spent more time watching television or playing computer games had a higher prevalence of constipation (25.1%) compared to those who spent less time (17.0%).

**Table I: Sociodemographic characteristics of participants**

| Characteristics | | Frequency (N = 935) | Percent (%) |
|---|---|---|---|
| Sex | Male | 431 | 46.1 |
| | Female | 504 | 53.9 |
| Age (years) | 10 – 12 | 174 | 18.6 |
| | 13 – 16 | 642 | 68.7 |
| | 17 – 19 | 119 | 12.7 |
| School type | Public | 626 | 67.0 |
| | Private | 309 | 33.0 |
| Family type | Monogamous | 542 | 58.0 |
| | Polygamous | 263 | 28.1 |
| | Single/Separated/Divorced | 130 | 13.9 |
| Socioeconomic class | Low | 456 | 48.8 |
| | Middle | 461 | 49.3 |
| | High | 18 | 1.9 |
| Ethnic groups | Ijaw | 407 | 43.5 |
| | Epie | 129 | 13.8 |
| | Igbo | 126 | 13.5 |
| | Nembe | 119 | 12.7 |
| | Ogbia | 65 | 7.0 |
| | Isoko/ Urhobo | 53 | 5.7 |
| | Ibibio | 24 | 2.6 |
| | Yoruba | 12 | 1.3 |

**Table II: Anthropometric characteristics of participants**

| Variable | Range | Mean Male (SD) | Mean Female (SD) | Mean Total (SD) | T | p-value |
|---|---|---|---|---|---|---|
| **Weight (kg)** | 27.0-97.0 | 49.19±11.03 | 49.50±9.89 | 49.4 | 0.450 | 0.65 |
| **Height (m)** | 1.3-1.9 | 1.62±0.11 | 1.59±0.08 | 1.6 | 4.204 | 0.00 |
| **BMI (kg/m$^2$)** | 12.4-38.4 | 18.60±2.79 | 19.44±3.25 | 19.1 | 4.184 | 0.00 |
| **BMI-for-Age** | -4.46- +3.59 | -0.52±1.21 | -0.17±1.08 | -0.33 | 4.657 | 0.00 |

*Predictive factors for constipation among participants*

The factors independently predicting constipation among participants are shown in Table V. Of all the six factors that were significant at the bivariate analysis level (family history of constipation, public school attendance, reduced intake of fruits, reduced fibre intake, > 5 hours television viewing per week and no watermelon consumption), four remained significant at the multivariate analysis level. The odds of having constipation increased significantly among participants with a family history of constipation ($p = 0.001$), attending public school ($p = 0.029$), and having television/video game time of ≥ 5 hours/day ($p = 0.028$).

## Discussion

In this study, the prevalence of constipation was 18.8%, which is similar to those reported by workers in Chu *et al.* in China (18.8%)[15] and Costa *et al.* in Brazil (18.2%).[16] It is also within the range of 0.7% to 29.6% reported worldwide in the paediatric population.[1,3] In contrast, Udoh *et al.*[5] noted a higher prevalence of 27% in southern Nigeria.

The dissimilarity in the result of this study compared to that of Udoh *et al.* [5] could be related to the place of residence of the participants as Udoh *et al.*[5] studied a population living in both rural and urban areas while the present study was carried out predominantly in urban areas. Chaud *et al.*[17] in Brazil noted a prevalence of 30.8% in their study of 52 tertiary education students, which was above the worldwide prevalence. This unusually high prevalence may be due to the small sample size and the older population used in that study as compared to the present study.

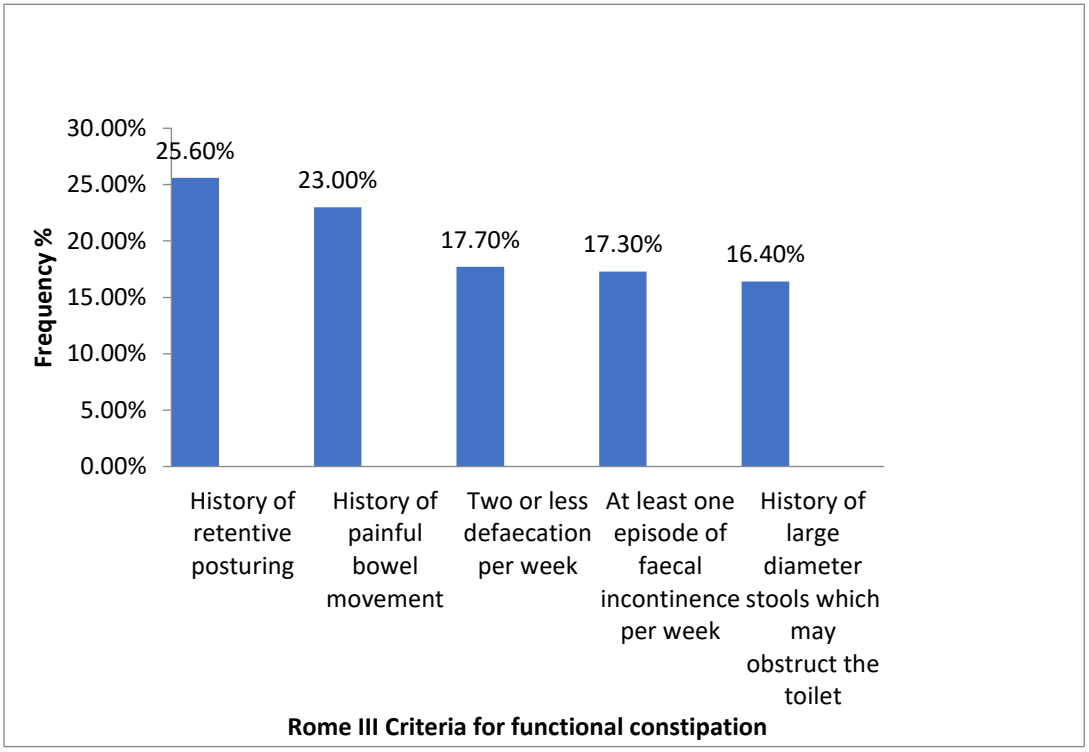


**Figure 3: Distribution of participants based on ROME III criteria for functional constipation**

The participants who were constipated frequently experienced retentive posturing or excessive stool retention, painful or hard bowel movements, and infrequent bowel opening (< 2 bowel opening/week). Hannifah *et al.*[18] studied 1796 adolescents in Indonesia and found similar symptoms of abdominal pain and straining in 18% of the participants, while Loening[19] reported infrequent bowel movements and painful bowel movements in his study population. These symptoms are similar to those Hannifah *et al*[18] and Loening reported.[19] Hard/ lumpy stools, sense of incomplete evacuation and large volume stools were the most reported symptoms by constipated participants in China by Ying *et al*.[20] Faecal incontinence was the least reported symptom in the present study, corroborating the finding of Loening.[19] However, Rajindrajith *et al*.[10] reported a high percentage (81.8%) of faecal incontinence in participants with constipation. A plausible explanation for this disparity could be differences in objectives and methodology, as Rajindrajith *et al.*[10] studied faecal incontinence primarily.

In the present study, 17.9% of females and 20% of males were constipated. This agrees with the findings of Devanarayana *et al.*[21] in Sri Lanka and

Olaru *et al.*[22] in Romania but dissimilar to those of Sujatha *et al.*,[7] and Afzal *et al.*[23] who reported a female preponderance. However, Udoh *et al.*,[5] Tam *et al.*[24] and Chaud *et al.*[17] found no sex predilection in their respective studies. The reason why males may be more constipated was not clear, though it is believed that the female hormone, oestrogen, causes changes in muscle tone and decreased gastrointestinal motility, which predisposes them to constipation, as suggested by Afzal *et al.*[23]

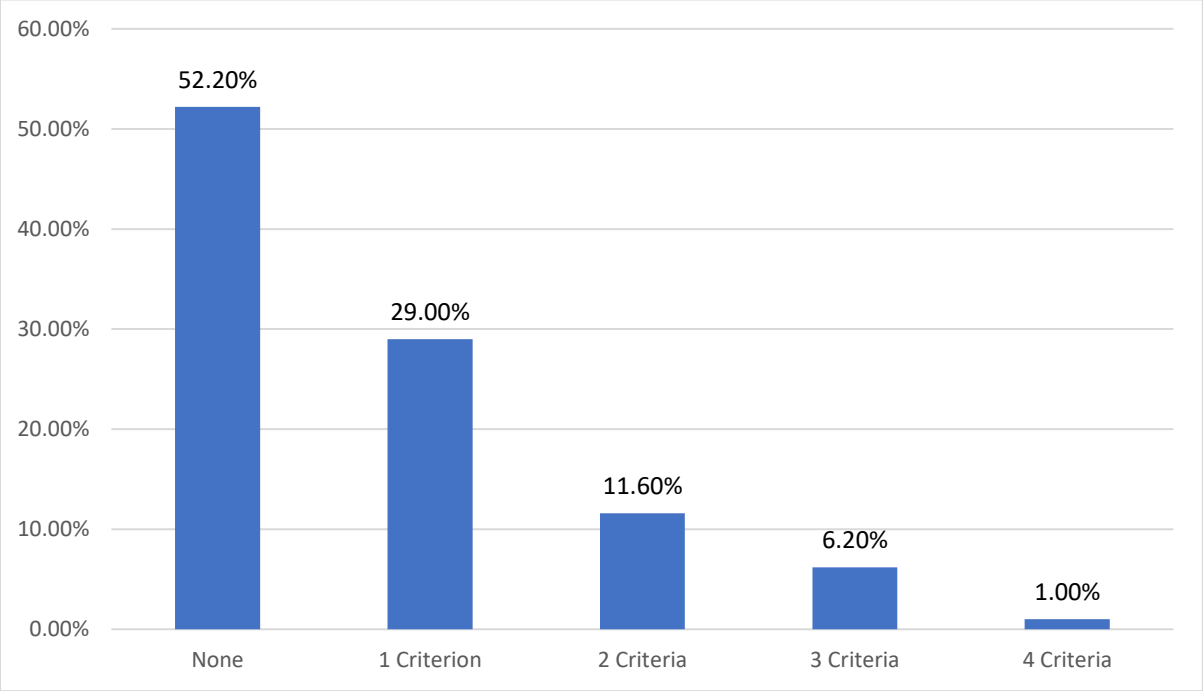


**Figure 4: Number of Rome Criteria per participant.**

Constipation was reported more commonly among those attending public secondary schools. Studies have reported poor school toilet hygiene as a possible contributory factor.[25-26] Unhygienic school toilets have been attributed to stool withholding and constipation. This may also contribute to the high prevalence of constipation among those attending public schools, which are more likely to have dirty and unhygienic toilets than private schools in the study locale.[24] Tam *et al.*[24] reported a 16.3% prevalence of constipation among elementary school students who refused to empty their bowels in the school toilet, compared to 8.7% who willingly used the school toilet.

The present study observed that a positive family history of constipation had a strong relationship with the prevalence of constipation, corroborating the findings of other workers.[1,2,27,28] One-third of those with a positive family history in this study had constipation. This is similar to that reported by Olaru *et al.*[22] and Borowitz *et al.*[28] in Romania and America, respectively. Chaud *et al.*,[17] however, did not find any correlation between constipation and family history. Their small sample size could explain this. The role of genetics in constipation is ill-understood to date and could be the focus of a future study.[29]

A relatively high prevalence of constipation was observed among participants who were obese. This is similar to the findings of Xinas *et al.*,[1] Olaru *et al.*[22] and Santos *et al.*[30] who also observed high prevalence of constipation among

their obese subjects. Obesity has been shown to have a positive correlation with constipation, probably because of decreased activity and consumption of low-fibre-containing foods like processed foods, which are common problems among the obese.

**Table III: Association between constipation and sociodemographic characteristics of participants**

| Variables | | Constipation | | P-value | UOR⁺ (95% CI) |
|---|---|---|---|---|---|
| | | Yes | No | | |
| **Gender** | Male# | 86 (20.0) | 345 (80.0) | - | 1 |
| | Female | 90 (17.9) | 414 (82.1) | 0.414 | 1.15 (0.82, 1.59) |
| **Age group (years)** | 10-12# | 34 (19.5) | 140 (80.5) | - | 1 |
| | 13-16 | 117 (18.2) | 525 (81.8) | 0.692 | 0.92 (0.60, 1.40) |
| | 17-19 | 25 (21.0) | 94 (79.0) | 0.758 | 1.10 (0.61, 1.95) |
| **Socioeconomic status** | High# | 1 (5.6) | 17 (94.4) | - | 1 |
| | Middle | 92 (20.0) | 369 (80.0) | 0.163 | 4.24 (0.56, 32.26) |
| | Low | 83 (18.2) | 373 (81.8) | 0.199 | 3.78 (0.50, 28.83) |
| **Family history** | No# | 148 (17.5) | 700 (82.5) | - | 1 |
| | Yes | 29 (33.3) | 58 (66.7) | 0.001* | 2.38 (1.48, 3.85) |
| **School type** | Private# | 42 (13.6) | 267 (86.4) | - | 1 |
| | Public | 135 (21.6) | 491 (78.4) | 0.004* | 1.73 (1.19, 2.53) |
| **BMI Category** | Thinness# | 16 (23.5) | 52 (76.5) | - | 1 |
| | Normal | 138(18.3) | 6177 (81.7) | 0.289 | 1.38 (0.76, 2.48) |
| | Overweight | 11 (14.5) | 65 (85.5) | 0.168 | 1.82 (0.78, 4.25) |
| | Obesity | 11 (30.6) | 25 (69.4) | 0.438 | 0.70 (0.28, 1.73) |

***Statistically significant # Reference category + unadjusted odds ratio CI- Confidence Interval**

**Table IVa: Association between constipation and physical activity among participants**

| Variables | | Constipation | | | $X^2$ (p-value) | UOR⁺ (95% CI) |
|---|---|---|---|---|---|---|
| | | Total | Yes | No | | |
| **Are you engaged in any form of exercise?** | Yes | 781 (81.8) | 144 (18.4) | 637 (81.6) | 0.46 | 0.86 (0.56 – 1.32) |
| | No | 154 (18.2) | 32 (20.8) | 122 (79.2) | (0.497) | 1 |
| **How many hours of exercise per week?** | 1 | 389 (49.8) | 80 (20.6) | 309 (79.4) | 2.39 | 1.44 (0.72 – 2.86) |
| | 2 | 320 (41.0) | 53 (16.6) | 267 (83.4) | (0.302) | 1.10 (0.54 -2.23) |
| | 3 | 72 (9.2) | 11 (15.3) | 61 (84.7) | | 1 |
| **Type of exercise** | | | | | | |
| **Athletics** | Yes | 139 (14.9) | 28 (20.1) | 111 (79.9) | 0.18 | 0.90 (0.58 – 1.42) |
| | No | 796 (85.1) | 148 (18.6) | 647 (81.4) | (0.671) | 1 |
| **Football** | Yes | 363 (38.9) | 66 (18.2) | 297 (81.8) | 0.17 | 1.07 (0.77 – 1.51) |
| | No | 572 (61.1) | 110 (19.3) | 462 (80.7) | (0.680) | 1 |

**Table IVb: Association between constipation and physical activity among participants**

| Variables | | Constipation | | | $X^2$ (p-value) | UOR+ (95% CI) |
|---|---|---|---|---|---|---|
| | | Total | Yes | No | | |
| **Basketball** | Yes | 44 (4.7) | 6 (13.6) | 38 (86.4) | 0.82 | 1.49 (0.62 – 3.59) |
| | No | 891 (95.3) | 170 (19.1) | 720 (809) | (0.366) | 1 |
| **Swimming** | Yes | 95 (10.1) | 13 (13.8) | 81 (86.2) | 1.72 | 1.50 (0.82 – 2.76) |
| | No | 840 (89.9) | 163 (19.4) | 677 (80.6) | (0.190) | 1 |
| **Tennis** | Yes | 65 (7.0) | 14 (8.0) | 51 (78.5) | 0.33 | 0.84 (0.45 – 1.55) |
| | No | 870 (93.0) | 162 (18.6) | 707 (81.4) | (0.565) | 1 |
| **Duration of Television Viewing Day** | 1 | 405 (43.3) | 69 (17.0) | 336 (83.0) | 6.27 | 0.61 (0.40 – 0.93) |
| | 2 | 339 (36.3) | 59 (17.4) | 280 (82.6) | (0.044) | 0.63 (0.41 – 0.96) |
| | 3 | 191 (20.4) | 48 (25.1) | 143 (74.9) | | 1 |

**Table V: Predictive factors for constipation among participants**

| Variables | | B | SE. | Wald | df | p-value | OR (95% CI) |
|---|---|---|---|---|---|---|---|
| **Family History of constipation[1]** | | 0.88 | 0.25 | 12.23 | 1.00 | 0.000* | 2.41 (1.47,3.94) |
| **Public schools attendance[2]** | | 0.46 | 0.20 | 5.49 | 1.00 | 0.019* | 1.59 (1.08,2.34) |
| **Frequency of fruit intake[3]** | Twice/week | -0.24 | 0.21 | 1.24 | 1.00 | 0.265 | 0.79 (0.52,1.19) |
| | Three times/week | -0.31 | 0.24 | 1.66 | 1.00 | 0.197 | 0.73 (0.46,1.18) |
| | Daily | -0.53 | 0.29 | 3.40 | 1.00 | 0.065 | 0.59 (0.33,1.03) |
| **Eating of watermelon[4]** | | -0.67 | 0.25 | 7.47 | 1.00 | 0.006* | 0.51 (0.32,0.83) |
| **Dietary fibre intake[5]** | Normal dietary fibre intake | -0.10 | 0.30 | 0.12 | 1.00 | 0.730 | 0.90 (0.51,1.61) |
| | High dietary fibre intake | -0.41 | 0.21 | 3.74 | 1.00 | 0.053 | 0.66 (0.44,1.01) |
| **Duration of television viewing/day[6]** | 3-4 hours | -0.01 | 0.20 | 0.01 | 1.00 | 0.965 | 1.01(0.68,1.50) |
| | ≥ 5 hours | 0.54 | 0.22 | 5.93 | 1.00 | 0.015* | 1.71 (1.11,2.63) |

**Reference categories: [1] No family history of constipation, [2] Private school type, [3] Once weekly fruit intake, [4] No watermelon consumption, [5] Low dietary fibre intake, [6] Television viewing ≤ 2 hours/day.**

Dietary fibre increases colonic osmotic load and stool bulk and decreases colon transit time.[10] Therefore, dietary fibre may result in increased stool volume and softness, which is protective of constipation, as seen in the current study. This also agrees with the findings of Roma *et al.*[29] and Santos *et al.*[30] and but disagrees with those of Jennings *et al*[27] and Chaud *et al.*[17] who did not find any relationship between dietary fibre intake and constipation. The reason for this dissimilarity is not clear, though it could be explained by the small sample size of Chaud *et al.*[17]

As reported by Huang *et al.*[31] and Paolla *et al.*,[32] this current study shows that those constipated had more television/computer viewing time than those occupied with activities that do not involve consistent sitting. The relationship between the amount of time spent watching television and constipation indicates that sedentary behaviour is linked to an increased risk of constipation in both adults and adolescents, as observed by Sonnenberg *et al.*[33] and Muller-Lissner *et al*.[34]. The present study shows that the prevalence of constipation was higher in those who did not exercise than those who did. Huang[31] reported 19.6% constipation among adolescents who did not exercise, compared to 14% of those who exercised. On the contrary, the study by Paolla *et al*. [32] on ten Italian men found no relationship between a sedentary lifestyle and constipation, though their study population was small.

## Conclusion

The prevalence of constipation among adolescent secondary school students in this study was 18.8%. The identified risk factors for constipation were positive family history, public school attendance, not taking watermelon, and screen time of ≥ 5 hours daily. The common symptoms were abdominal pain, straining at defecation, and soiling of underwear.

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