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RESEARCH ARTICLE

PREVALENCE, CHARACTERIZATION AND RISK FACTORS OF CHRONIC CONSTIPATION AMONG SAUDI CHILDREN: A CROSS-SECTIONAL STUDY.

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Abstract

Background: Childhood constipation is a common gastrointestinal disorder worldwide and many factors have been associated with the occurrence of constipation.

Objectives: The aim of this study was to determine the prevalence and risk factors for chronic constipation among school-age children in Saudi Arabia.

Methods: A cross-sectional study was conducted between February 2016 to May 2016. We selected the two largest cities: Jeddah and Makkah in the Western region of Saudi Arabia. Children aged 7-17 years were recruited from 15 schools, using a random sampling technique in which all students have an equal and independent chance of being selected. A validated self-administered questionnaire on Rome III criteria for diagnosing chronic constipation and its predisposing factors was filled by each participant in a classroom setting.

Results: Of the 9100 questionnaires distributed to school children, 7644 (response rate 84%) were completed and analyzed. Chronic constipation was present in 2459 (32.2%) with significant differences in constipation between girls and boys (77.6% vs 22.3%; $p < 0.001$). The significant risk factors for chronic constipation included family history of constipation (OR=2.69, 95% CI = (2.33-3.09) and psychological/behavioral problems (OR=3.02, 95% CI (2.42-3.76). School toilet phobia, night sleeping <7 hours, homework >3 hours/day, omitting breakfast and exercise in school did not predispose the students to develop chronic constipation (all $p < 0.001$).

The following variables were found to be significantly associated with chronic constipation; straining during defecation (OR = 30.15, 95% CI = (24.88-36.53), painful defecation (OR=18.41, 95% CI = (15.89-21.35), bloody stool (OR = 3.97, 95% CI = (3.16-4.99), and fecal incontinence (OR = 7.84, 95% CI = (6.49-9.47).

Conclusion: Chronic constipation is a significant health problem among Saudi children. Exposure to stressful life events at school did not predispose the participants to develop constipation. Chronic constipation prevalence of 32.2% in study population warrants preventive measures such as health education and preventing childhood psychological insults.

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Introduction:-

Chronic constipation is a worldwide problem, both in developed and developing countries. The problem has also been reported to account for 3% of all visits to pediatric outpatient clinics and up to 25% of all referrals have been ultimately cared for by a pediatric gastroenterologist (1). The prevalence of childhood constipation varies from study to study and from country to country, ranging between 0.7% and 29.6% (median 12%) (2). The peak incidence of chronic constipation in preschool children at the time of toilet training might be due to their withholding manner while the peak in school age (6-7 years) might be due to their concerned about cleanliness of the toilet or anxiety and stressful life events at schools (3,4).

A study conducted in Hong Kong found that socio-environmental factors play an important role in determining the prevalence of constipation in school children such as refusal to pass bowel movements in school toilets, heavy homework and inadequate sleep (3). Another study demonstrated the prevalence of constipation is significantly higher in those with a family history of constipation and attending an urban school (5).

We conducted a study among Saudi pediatric providers (PPs) regarding chronic constipation. We found significant differences in knowledge gap and practice patterns exist among PPs from different regions of Saudi Arabia regarding the definition and the cause of constipation, performance of rectal examination, use of laxatives therapy, and management of childhood constipation (6). To date, there is a lack of local data concerning the prevalence of constipation in Saudi school children. The aim of this study was to evaluate the prevalence of constipation among school-age children and to identify the risk factors associated with chronic constipation.

Methods:-

Participants:-

A cross-sectional questionnaire survey was conducted from February 2016 to May 2016. Participants were students (male and female) studying in elementary, intermediate and tertiary schools. They were Saudi and non-Saudi students. An informational letter was sent to the principal of the school to explain the study and invited students to participate by filling out an anonymous questionnaire to identify the constipated students.

Inclusion criteria were age more than 7 year-old and less than 18 year-old, and enrolled students in Jeddah and Makah cities. Exclusion criteria were included the missing data filled by students.

2-Sample Size Estimation and Study Sample Selection:-

We assumed that the prevalence rate of constipation in our school children is 20%. According to the latest figure provided by the Ministry of Education, there were approximately 356,000 school students in Jeddah and Makah cities. The sample size required for the study was approximately 384 (95% confidence interval). Finally, 15 schools were selected randomly and agreed to participate. The geographical distribution of these schools was north, south, west and east regions of Jeddah and Makkah cities.

Questionnaire and Data Collection:-

The questionnaire was pilot tested by a sample of students (120 students). They were not included in the final analysis. The questionnaire was then revised based on reproducibility, validity, and question value. An initial pool of items was evaluated for content and understandability by 5 pediatric gastroenterologists. Changes and modifications were made based on the pilot results. The survey was administered during a 4-month period from February 2016 to May 2016 via direct contact to students. The 2-sheet questionnaire contained 23 items and was written in the Arabic language. If the items were not clear, the teacher or research staff assisted the students. The questionnaire covered 4 main areas: sociodemographic information of the child, school toilet environment, lifestyle of the child, and questions related to bowel movements.

Questions in questionnaires were related to the individual's history and possible risk factors which are the following: age, nationality, gender, school type, stool characteristics (frequency, shape, painful defecation, bloody stool, straining during defecation and fecal incontinence), missing breakfast in school, school-toilet phobia, adequate night sleeping, heavy homework at home, missing exercise in school, enough intakes of fibers and water drinking, family history of constipation, psychological or behavioral problems and medication related to constipation.

Constipation was defined in the present study if students fulfilled the Rome III diagnostic criteria by having 2 or more of the 6 conditions: two or less defecations per week; one or less episodes of fecal incontinence per week; retentive posturing or excessive volitional stool retention; history of painful or hard bowel movements; passage of large stools that clog the toilet; and detection of large fecal mass in the rectum by doctors or nurses (7).

Statistical Methods:-

A statistical analysis was performed using Stata/IC 12.1–2011 software (StataCorp LP, College Station, TX). The percentage of participants who responded to each question was determined.

The prevalence of constipation in our study subjects was estimated with the 95% confidence interval. Constipated and non-constipated children were compared in a univariate analysis using the χ^2 and t tests for categorical and continuous data, respectively.

Logistic regression was used in a multivariate analysis to identify independent risk factors associated with constipation and expressed in odds ratio with 95% confidence intervals. A P value of <0.05 was considered statistically significant.

Ethics:-

The ethics committee of King Saud University College of Medicine approved the study (No.E-17-2596). The students filled the consent under supervision of investigator or teacher. All of the information was collected kept strictly confidential.

Results:-

Demographics:-

Of the 9100 questionnaires distributed to school children, 7644 (response rate 84%) were completed and analyzed. According to Rome III diagnostic criteria, 2,459 students were constipated yielding the prevalence of constipation (32.2%). A majority of constipated students (n 1129; 45%) were between 16 and 18 years old. There were significant differences in constipation between girls and boys (77.6% vs 22.3%; $P= 0.001$). Other demographic characteristics of the study participants are listed in [Table 1].

Stool characteristics:-

When survey respondents were asked about the stool characteristics (stool shape, painful defecation, bloody stool, straining during defecation and fecal incontinence), there were significant differences in description of the stool as large and hard between constipated and non-constipated students (66% vs 34%; $P=0.000$). Other stool characteristics among constipated and non-constipated children are shown in [Table 2]. In the binary logistic regression model, the number of the students with large and hard stool being 9.5 times more likely to have chronic constipation (Odds Ratio (OR) = 9.5, 95% confidence interval (CI) = (8.43-10.67). Other variables were found to be significantly associated with chronic constipation included straining during defecation being 30 times more likely to have chronic constipation (OR = 30.15, 95% CI = (24.88-36.53), painful defecation being 18 times more likely to have chronic constipation (OR=18.41, 95% CI = (15.89-21.35), bloody stool being 4 times more likely to have chronic constipation (OR = 3.97, 95% CI = (3.16-4.99), and fecal incontinence being 7 times more likely to have chronic constipation (OR = 7.84, 95% CI = (6.49-9.47).

Risk factors of chronic constipation:-

Several potential risk factors were found to be significantly related to chronic constipation. These included the following: family history of constipation ($p = 0.001$), and psychological/behavioral problems ($p = 0.001$). Table 3 shows other risk factors associated with chronic constipation.

Our results showed that omitting breakfast in school, night sleeping <7 hours, school toilet phobia, homework >3 hours/day and omit exercise in school were significantly not associated with chronic constipation ($p < 0.001$).

Subjects who omitted breakfast in school were 0.8 times more likely to have non-constipation compared with subjects who ate breakfast. Those with school toilet phobia were 2.12 times less likely to have chronic constipation compared with those without toilet phobia. Moreover, students who had night sleeping <7 hours were 1.16 times more likely to have non-constipation compared with students who had night sleeping >7 hours.

Table 1:-Demographic characteristics of the students

Variables	Constipated N (%)	Non-constipated N (%)	P value	OR	95% CI
Age					
< 10 years	51 (2.07)	99 (1.91)	0.001		
10-12 years	531 (21.59)	1,231 (23.74)			
12-15 years	748 (30.42)	1,826 (35.22)			
Over 15 years	1,129 (45.91)	2,029 (39.13)			
Gender					
Boy	550 (22.37)	1,616 (31.17)	0.001	0.636	0.569-0.711
Girl	1,909 (77.63)	3,569 (68.83)			
Nationality					
Saudi	1,968 (80.03)	4,248 (81.93)	0.047	0.8841	0.7829-0.9984
Non-Saudi	491 (19.97)	937 (18.07)			
School type					
Government	2,241 (91.51)	4,757 (92.39)	0.184	0.887	0.744-1.058
Private	208 (8.49)	392 (7.61)			

OR: Odds Ratio, CI: confidence interval

Table 2:- Summary of students' stool characteristics among constipated and non-constipated children

Variable	Positive for constipation n (%)	Negative for constipation n (%)	P value	OR	95% CI
Stool shape (hard and big)	1,631 (66.06)	838 (33.94)	0.001	9.5	8.43-10.67
Straining during defecation	1,145 (45.78)	132 (10.34)	0.001	30.15	24.88-36.53
Painful defecation	1,299 (82.37)	278 (17.63)	0.001	18.41	15.89-21.35
Blood in the stool	238 (67.04)	117 (32.96)	0.001	3.97	3.16-4.99
Fecal incontinence	528 (77.53)	153 (22.47)	0.001	7.84	6.49-9.47

Table 3:-Risk factors among constipated and non-constipated children

Variable	Positive for constipation n (%)	Negative for constipation n (%)	P value	OR	95% CI
No breakfast in school	678 (38.74)	1,072 (61.26)	0.003	0.84	0.75-0.94
School toilet phobia	1,184 (45.78)	1,402 (54.21)	0.001	2.12	1.90-2.36
Night sleeping <7 hrs	1,056 (37.69)	1,746 (62.31)	0.006	1.16	1.04-1.29
Homework >3 hrs/day	619 (38.88)	973 (61.11)	0.004	0.84	0.75-0.95
No exercise in school	1,338 (38.17)	2,167 (61.83)	0.001	0.76	0.68-0.85
Difficulty in learning scientific lessons*	1,026 (40.40)	1,513 (59.59)	0.001	1.43	1.28-1.59
Family history of constipation	543 (55.13)	442 (44.87)	0.001	2.69	2.33-3.09
Psychological / Behavioural problems	217 (60.61)	141 (39.39)	0.001	3.02	2.42-3.76

*lessons (Maths, science, chemistry, physics)

Discussion:-

To our knowledge, this is the largest study to examine the risk factors and the prevalence of chronic constipation among school-age children used pediatric Rome III criteria to define constipation. Our finding of 32.2% of children having constipation is comparable with the prevalence rates of 30% reported in Hong Kong (8). This result is higher

than that previously observed in previous studies (5, 9). The prevalence of chronic constipation was found to increase with age (Tables 1) which is similar to previous studies (10, 11). Interestingly, in our study, the age between 16 and 18 years old seemed to be an important risk factor for chronic constipation. We found a sex difference in the prevalence of constipation in our study children that girls are more affected with constipation than boys. The data of Mugie et al (2) taken together with the observation in our study suggests that female gender and increasing age, seemed to affect constipation prevalence.

According to the Rome III criteria, 67% to 92% of our students fulfilled the criteria for functional constipation. Similar to previous studies (12, 13) we used Rome III criteria in childhood defecation disorders for application in clinical and research practice. In contrast previous study et al (3), constipation was found to be significantly more prevalent in children refused to pass bowel movements in school. Our study shows that school toilet phobia were 2.12 times less likely to have chronic constipation compared with those without toilet phobia. This may explain that the teachers' attitude, child's personality and cleanliness and the facilities of their school toilets may contribute public education to promote a positive attitude toward the use of school toilets. Similar to the observations by Devanarayana et al (14) constipation was significantly higher in children exposed to stressful life events such as separation from the best friend, failure in an examination, severe illness of a family member and loss of job by a parent. However in our study, psychological/behavioral problems were not defined by Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Our data showed that family anxiety, child stress and frequent punishment by parents remained independently associated with constipation.

In the same study conducted by Tam et al (3) inadequate sleep and busy homework were associated with constipation in school-age children. Our logistic regression analysis model did not find a relationship between constipation and inadequate sleep and busy homework. It is not clear whether fatigue due to inadequate sleep and busy homework may or may not modulate gut motility through its role in the brain-gut axis because fatigue has been reported to be associated with irritable bowel syndrome in adolescents (15).

The strengths of our study are the largest numbers of students recruited in this cross-sectional survey and most questionnaires were filled out under the supervision of the investigators or teachers to avoid misinterpretation of the questions. This study has several limitations. There may be some response bias. The older students in our sample demonstrated a higher response rate than younger students, possibly because of more interest or more understanding of defecation disorders.

In summary, our data support the findings of previous studies showing high prevalence of chronic constipation. This survey may provide motivation to researchers in other regions to assess the exposure to stressful life events at school and home and preventing childhood constipation insults. We recommend awareness creation on constipation among school-aged children and risk factors counseling to parents.

Conclusion:-

Chronic constipation is a significant problem affecting 32% of Saudi school children and it is prevalent in Arab society as in western populations. Family history of constipation and psychological / behavioural problems are independent risk factors associated with chronic constipation. However, exposure to stressful life events (school toilet phobia, school homework >3 hours/day, omitting breakfast and exercise in school) did not predispose the participants to develop chronic constipation.

Potential conflicts of interests:-Nil

Financial support:-Nil

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