

Print ISSN : 0972-8813
e-ISSN : 2582-2780

[Vol. 18(3), Sept-Dec, 2020]

Pantnagar Journal of Research

(Formerly International Journal of Basic and
Applied Agricultural Research ISSN : 2349-8765)



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Study of constipation and related factors among female students of Pantnagar

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ABSTRACT: Constipation is the most common gastrointestinal disorder worldwide. A cross-sectional, interviewer-administered survey was carried out to measure the prevalence and determinants of constipation among hostel residing female students. Randomly selected 200 female students (20-30 years) residing in the university hostels of Pantnagar were interviewed to assess the prevalence of constipation. A pre-tested, structured questionnaire was used to collect information on stool-type, anthropometric profile, dietary habits, defecation pattern, physical activity, and general information. The data were presented in percentages; chi-square analysis and rate ratio were calculated to analyse the association between dependent and independent variables. The result showed that the prevalence of constipation was 20.5% among the subjects, as evaluated by the Bristol stool form scale. The prevalence of mild to severe diarrhoea was reported to be 22% among the subjects. Constipation was found to be significantly associated with body mass index, waist to hip ratio, physical activity, dietary fibre, meal skipping, water intake, and eating out frequency. It was found that the risk of constipation was thrice in overweight and obese subjects than underweight and normal subjects. The water intake of fewer than 1.5 litres per day increased the risk of constipation nine times among subjects. Lower dietary fibre intake increased the risk of constipation by thirteen times. The study concluded that less dietary fibre intake, less fluid intake, fast food consumption, meal skipping, higher waist to hip ratio, higher body mass index, and sedentary lifestyle increases the risk of constipation among the hostel residing female students.

Key words: Anthropometry, bristol stool form scale, constipation, hostel students, women

Constipation is the most common gastrointestinal disorder worldwide. The word constipation comes from the Latin word “constipare”, meaning to crowd together. Constipation is defined as having a bowel movement fewer than three times per week. It is considered as a disorder with the occurrence of infrequent dry, hard, or small stools that are difficult to expel with the sensation of incomplete evacuation (Arnaud, 2003). Constipation is accompanied by headache, foul breath, flatulence, coated tongue, discomfort, and lack of appetite. Constipation means lowered bowel functioning with a lack of secretions and excretions (Raghuvanshi and Mittal, 2014). A community-based study conducted in India reported a 16.8% prevalence of constipation based on Rome II criteria, while self-reported constipation was found to be 24.8% (Rajput and Saini, 2014). The study also reported that constipation was more prevalent among females than males (20% vs. 13%). The risk factors associated with constipation are changes in diet, inactivity, aging, depression, low-calorie intake, low fibre intake, medications, and female gender (Lindberg *et al.*, 2010). Changing lifestyle and reluctance to health promotes many unhealthy habits among college students, which disturbs the metabolic functions of the body.

Keeping these points in mind, the study was undertaken

with the following objectives:

1. To determine the prevalence of constipation among hostel residing female students.
2. To determine the association of constipation with body mass index, waist to hip ratio, diet pattern, water intake, dietary fibre, and physical activity.

MATERIALS AND METHODS

Study setting and participants

A cross-sectional study was conducted among 200 female subjects (20 to 30 years) residing in the University hostels of Pantnagar. Simple random sampling was used to select participants for the study, as shown in Figure 1. Females below 20 and above 30 years of age and with current or relevant history of any severe illness or any medical disorder were excluded from the study.

Development of questionnaire and collection of data

The data was collected using a pre-tested and structured questionnaire from February to April 2019. Before data collection, participants were given detailed information

regarding the survey and informed written consent was obtained. The face-to-face interview schedule was planned to collect information on stool-type, anthropometric profile, diet pattern, defecation pattern, physical activity, and general information of subjects.

Prevalence of constipation

Bristol stool form scale was used to measure the prevalence of constipation (Lewis and Heaton, 1997). Stool types 1 and 2 are considered as severe and mild constipation, respectively. Type 3 and 4 are considered as a normal stool, respectively. Type 5, 6, or 7 indicates diarrhea.

Anthropometric measurements

Height, weight, waist, and hip circumference measurements were taken using standard methods based on the WHO STEPS manual, 2017 (WHO, 2017). Body mass index and waist to hip ratio was calculated to determine the overall obesity and abdominal obesity among the subjects, respectively. WHO BMI classification for Asian, 2004 (WHO, 2004) and WHO cut-off points for waist-hip ratio (WHO, 2011) was used as a standard for categorizing subjects.

Diet pattern and physical activity

The 24-hour dietary recall was conducted for three consecutive days to determine the dietary pattern of the subjects. Indian Food Composition Tables, 2017 was referred to as calculating the dietary fiber present in the subjects' food (Longvah *et al.*, 2017). The eating out frequency of subjects was divided into three categories, namely, heavy (subjects consuming fast food every day), moderate (subjects consuming fast food 3 to 6 days in a week), and mild (subjects consuming fast food 1 to 3 days in a week).

Physical activity was assessed through the following questions: "At least once a week, do you engage in any regular activity similar to brisk walking, jogging, bicycling, and long enough to work up a sweat? If yes, how many times per week?"

Statistical analysis

The data were coded for statistical analysis using R software. Descriptive analyses performed including, frequencies and percentages, to summarize the characteristics of the entire sample and each of the segments of the questionnaire. Pearson Chi-square analysis and rate ratio were calculated to determine the association

between constipation (dependent variable) and independent variables such as body mass index, waist to hip ratio, meal skipping, eating out frequency, water intake, dietary fibre, and physical activity. The level of significance was determined at P-value <0.05, with a 95% confidence interval.

RESULTS AND DISCUSSION

General information

Table 1 depicts the general information, where 94.5% of the subjects were in the age group of 20 to 25 years, while only 5.5% of the subjects were between 25 to 30 years. The study comprised 74.5% of Masters students and 25.5% of Doctorate students. Government services were reported to be family occupation among half of the subjects, *i.e.*, 54.5%. The majority of subjects (70%) reported a monthly family income of 25,000 to 75,000 INR.

The anthropometric profile, as shown in Table 2 depicts that 68.5% of subjects had normal body mass index (BMI). About 12% of the subjects were underweight with a BMI of less than 18.5 kg/ m². A total of 12.5% of the subjects were overweight, while 7% of the subjects were obese. As per NFHS-4 (IIPS and ICF, 2018), 61.1% of women in the age group of 20 to 29 years reported having normal BMI while 18.4% and 20.5% were underweight and overweight in Uttarakhand, respectively. Among 200 subjects, 35% reported having a waist-hip ratio greater than 0.85, which indicates the risk of metabolic complications.

Prevalence of constipation

As per the Bristol stool form scale, type 1 stool consistency was reported among 2% of subjects, indicating severe constipation (Table 3). About 18.5% of subjects had mild constipation with type 2 stool consistency. Thus, the total prevalence of constipation was reported to be 20.5% (95% confidence interval: 17.89-23.11) in the present study. The normal stool consistency of type 3 and type 4 was reported among 24.5% and 33% of the subjects. About 13% of subjects reported having no problem passing stool, but due to lack of fibre in the diet, soft blobs type stool was observed and categorized under type 5 stool consistency. While 6.5% and 2.5% of subjects suffered from moderate & severe diarrhea, respectively. Lim *et al.*, 2016, reported that constipation was 16.2% among students, with a significantly higher prevalence among women (17.4%) than men (12.5%). In Asia, the prevalence of constipation was 15% to 23% among women and 11% among men

(Gwee *et al.*, 2013). A cross-sectional study conducted in the urban South Indian population reported Bristol stool type 1 or 2 among 20.5% of the subjects and type 3 and 4 among 35.6% and 32.5% of the subjects, respectively (Srinivas *et al.*, 2019).

Diet pattern and physical activity pattern

Table 4 presents the diet pattern and physical activity pattern among hostel residing female students. About 19.5% of the subjects had water intake greater than 2.5 litres per day, 21% of the subjects had water intake less than 1.5 litres per day, while 39% of the subjects reported consuming 1.5 to 2.5 litres of water a day. A total of 10.5% of the subjects reported dietary fibre intake less than recommended levels. An unhealthy diet pattern of meal skipping was observed among 29.5% of the total subjects, while 70.5% regularly consume their meals. Hostel students are engaged in eating fast foods. About 86% of the subjects regularly prefer eating outside 1 to 3 days a week, which fulfils 29.5% of meal skipping practice. The remaining 56.5% of eating outside for 1 to 3 days per week leads to overeating and subsequent obesity among subjects. About 11% of the subjects frequently eat outside for 3 to 6 days a week, while 3% eat outside for seven days a week. It was also observed that 60% of total subjects had a sedentary lifestyle while only 40% had a moderately active lifestyle like playing basketball, running. A pilot study conducted among university students reported a sub-optimal diet with less consumption of vegetables, fruits, and healthy fats than the recommended levels among most subjects. Simultaneously, 86.5% of the subjects ate more than the recommended levels of sweets and fatty foods (Al-Khamees, 2009). Vibhute *et al.* (2018) reported that only 10% of medical students consume fruits daily. Fried snacks were the most preferred snack (39%), followed by bakery items among the students, while only 7% of students preferred salads and soups for snacking.

Constipation and related factors

In the present study, chi-square analysis and rate ratios were calculated to determine the association of constipation with independent variables, namely: body mass index, waist-hip ratio, physical activity, dietary fibre, meal skipping, water intake, and eating out frequency. The chi-square analysis results are presented in Table 5, which shows a statistically significant ($p < 0.05$) relation between constipation and the above variables.

Constipation was significantly higher among overweight and obese subjects than the underweight and normal subjects ($p = 0.0009$). Moderate strength of association was reported between constipation and body mass index with

the rate ratio of 2.56. The finding of the present study is in line with previous studies. A similar community-based study conducted in Iran reported that 60% of women with functional constipation were overweight (Pourhoseingholi *et al.*, 2009). A study conducted among adolescents by Costa *et al.* (2011) reported that fecal incontinence associated with constipation was more frequent in overweight adolescents (37%) than in adolescents who were not overweight (8.5%). The study conducted by Pecora *et al.*, 1981, indicated a statistically significant association between obesity and constipation ($p < 0.001$).

Waist to hip ratio greater than 0.85 was found to be significantly associated with constipation ($p = 0.0007$) and increased the risk of constipation by three times (rate ratio = 2.62) as reported in the present study. Huang *et al.* (2017) reported a higher prevalence of constipation in women with waist to hip ratio > 0.85 . A study conducted among male students in Iran reported that constipated students had a significantly higher waist to hip ratio (Ghaderpour *et al.*, 2015). In the present study, irregular meal pattern was found to be significantly associated with

Table 1: General information of the respondents

Attribute	Respondents	
	Frequency	Percentage
Age		
20-25 years	189	94.5
25-30 years	11	5.5
Degree program		
M.B.A/ M.Sc.	149	74.5
Ph.D.	51	25.5
Family occupation		
Govt.	109	54.5
Private	52	26
Business/ others	39	19.5
Family monthly income (INR)		
$\geq 25,000$	20	10
25,000-75,000	140	70
$\leq 75,000$	40	20

Table 2: Body mass index and the waist-hip ratio of respondents (20 to 30 years)

Body mass index (Kg/m ²)	Respondents	
	Frequency	Percentage
< 18.5 (underweight)	24	12
18-22.9 (normal)	137	68.5
23-24.9 (overweight)	25	12.5
> 25 (obese)	14	7
Waist-Hip Ratio		
≥ 0.85	130	65
> 0.85	70	35

Table 3: Stool consistency of respondents

Type	Description	Respondents	
		Frequency	Percentage
1	Separate hard lumps, like nuts (hard to pass)	4	2
2	Sausage shaped but lumpy	37	18.5
3	Like a sausage but with cracks on the surface	49	24.5
4	Like a sausage or snake, smooth and soft	66	33
5	Soft blobs with clear cut edges (passed easily)	26	13
6	Fluffy pieces with ragged edges, a mushy stool	13	6.5
7	Watery, no solid pieces, entirely liquid	5	2.5

Table 4: Water intake, dietary fibre, meal skipping, eating-out-frequency and physical activity pattern of respondents

Variables	Respondents	
	Frequency	Percentage
Water intake (Litres/ day)		
≤ 1.5	42	21
1.5-2.5	119	59.5
> 2.5	39	19.5
Dietary fibre (gram)		
10-20	21	10.5
20-30	36	18
30-40	143	71.5
Meal skipping		
Yes	59	29.5
No	141	70.5
Eating out frequency/ week		
1-3 days (mild)	172	86
3-6 days (moderate)	22	11
≥ 7 days (heavy)	6	3
Physical activity		
Sedentary	120	60
Moderate	80	40

constipation ($p=0.0003$), and moderate strength of association was reported between constipation and meal skipping with a rate ratio of 2.64. A study conducted among female students in Japan showed that skipping breakfast significantly lowers bowel movement frequency and induces constipation (Fujiwara, 2012).

Eating out practices like fast food consumption was significantly associated with constipation ($p=0.0004$) in the present study. The consumption of fast foods more than three times a week increased the risk of constipation five times (rate ratio=4.92) among the subjects. Chang *et al.* (2015) conducted a study among university students and reported that unhealthy behaviors, such as eating snacks, fried food, and junk food in place of regular food, were significantly correlated with chronic constipation. Findings of the study conducted by Kaur *et al.* (2016) indicated that the major problem associated with fast food consumption twice or thrice a week among children in 6 to 12 years was constipation.

Water intake of fewer than 1.5 liters per day significantly increased the risk of constipation ($p=0.0026$). A strong strength of association was reported between water intake and constipation with a rate ratio of 8.63. Rajput and Saini (2014) reported that 51.4% of individuals with less fluid intake suffered from constipation. Another study reported a significant association of water intake with the frequency of defecation, type of stool, blood in stools, and blockage (Jangid *et al.*, 2016). An evidence-based study conducted by Boilesen *et al.* (2017) indicated an association between lower fluid intake and intestinal constipation among children and adolescents.

Dietary fibre was found to be significantly associated with constipation ($p=0.003$). Lower dietary fibre intake increases the risk of constipation by thirteen times (rate ratio=12.6). Dietary fibre adds fecal bulk and stimulates peristaltic motility. Dukas (2003) reported similar findings that women in the highest quintile of dietary fibre intake (median intake 20 g/day) were less likely to experience constipation than women in the lowest

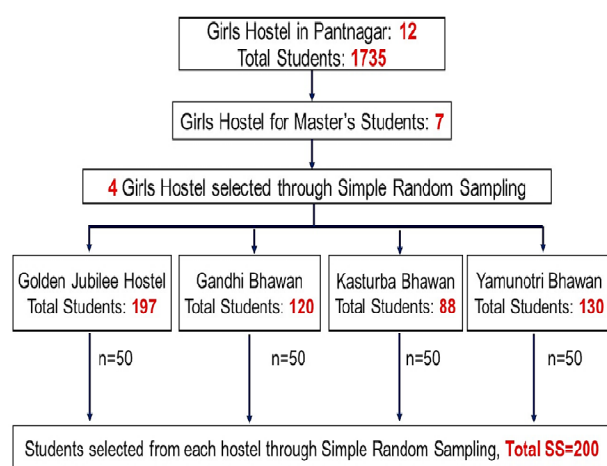
**Figure 1: Diagrammatic representation of the sampling procedure employed in the study**

Table 5: Determinants of constipation among hostel residing female students

Variable	Constipation		Total	Rate	Rate Ratio	Chi-sq. P-value
	Yes n=41	No n=159				
Body mass index						
Overweight & obese	16	23	39	0.41	2.56	0.0009*
Underweight & Normal	25	136	161	0.16		
Waist-hip ratio						
> 0.85	24	46	70	0.34	2.62	0.0007*
≥ 0.85	17	113	130	0.13		
Meal skipping						
Yes	22	37	59	0.37	2.64	0.0003*
No	19	122	141	0.14		
Eating out frequency						
Heavy & moderate	18	10	28	0.64	4.92	0.0004*
Mild	23	149	172	0.13		
Water intake (Litres/ day)						
≥1.5	29	13	42	0.69	8.63	0.0026*
>1.5	12	146	158	0.08		
Dietary fibre (gram)						
≥30	34	23	57	0.63	12.60	0.0026*
>30	7	136	143	0.05		
Physical activity						
Sedentary	32	88	120	0.26	2.36	0.013*
Moderate	9	71	80	0.11		

Note: *Significance level < 0.05

quintile (median intake seven g/day). Karabudak *et al.* (2019) reported a lower rate of constipation among young adults who consumed more whole grains, rice/pasta, and vegetables. A cost-of-illness analysis conducted by Abdullah *et al.* (2015) indicated that about a one gram per day increase in dietary fibre could save constipation-related healthcare costs. Some studies also reported a higher prevalence of constipation with a non-vegetarian diet (Rajput and Saini, 2014; Huang *et al.*, 2017)

The physical activity pattern of the subjects was found to be significantly associated with constipation ($p=0.013$). Moderate strength of association was reported between physical activity and constipation with a rate ratio of 2.36. A study conducted in China among women aged 50 years and older reported that less physical exercise was a significant risk factor for chronic constipation (Huang *et al.*, 2017). Dukas (2003) reported an inverse association between physical activity and low bowel movement with a 44% lower risk of constipation among women with daily moderate exercise patterns. De Schryver *et al.* (2005) reported improved defecation patterns with regular physical activity among middle-aged patients suffering from chronic constipation. A study conducted among adolescents reported that insufficient moderate-to-vigorous exercise and excessive sedentary behaviors were independently associated with constipation (Huang *et al.*, 2014).

CONCLUSION

Our study suggests that constipation is a common problem among hostel residing female students. Less intake of dietary fibre, less fluid intake, fast food consumption, meal skipping, higher waist to hip ratio, higher body mass index, and sedentary lifestyle increases the risk of constipation. Most of the cases of constipation often go under-reported, which leads to serious health problems. Promoting healthy behaviour among college students through nutrition education would be helpful to reduce the risk of constipation.

REFERENCES

- Abdullah, M.M.H., Gyles, C.L., Marinangeli, C.P.F., Carlberg, J.G. and Jones, P.J.H. (2015). Dietary fibre intakes and reduction in functional constipation rates among Canadian adults: A cost-of-illness analysis. *Food and Nutrition Research*, 59: 28646.
- Al-Khamees, N.A. (2009). Food habits of university nutrition students: pilot study. *Nutrition and Food Science*, 39(5): 499-502.
- Arnaud, M.J. (2003). Mild dehydration: A risk factor of constipation? *European Journal of Clinical Nutrition*, 57: S88-S95.

- Boilesen, S.N., Tahan, S., Dias, F.C., Melli, L.C.F.L. and Morais, M.B.D. (2017). Water and fluid intake in the prevention and treatment of functional constipation in children and adolescents: is there evidence? *Jornal De Pediatria*, 93(4): 320–327.
- Chang, L.-L., Lin, Y.-C., Lo, T.C., Chen, M.-C. and Kuo, H.-W. (2015). Understanding the Lifestyle Correlates with Chronic Constipation and Self-Rated Health. *Food and Nutrition Sciences*, 6(4): 391–398.
- Costa, M.L., Oliveira, J.N., Tahan, S. and Morais, M.B. (2011). Overweight and constipation in adolescents. *BMC Gastroenterology*, 11(40): 1–5.
- De Schryver A.M., Keulemans Y.C., Peters H.P., Akkermans L.M., Smout A.J., De Vries W.R. and Van Berge-Henegouwen G.P. (2005). Effects of regular physical activity on defecation pattern in middle-aged patients complaining of chronic constipation. *Scandinavian Journal of Gastroenterology*, 40(4): 422–429.
- Dukas, L. (2003). Association between physical activity, fiber intake, and other lifestyle variables and constipation in a study of women. *The American Journal of Gastroenterology*, 98(8): 1790–1796.
- Fujiwara, T. (2012). Skipping Breakfast is Associated with Constipation in Post-Adolescent Female College Students in Japan. Constipation - Causes, Diagnosis and Treatment. Anthony G. Catto-Smith, Intech Open, DOI: 10.5772/30641.
- Ghaderpour, S., Baveicy, K. and Jafarirad, S. (2015). Relationship of constipation and irritable bowel syndrome with food intake, anthropometric measurements and eating behaviors in male students. *Nutrition and Food Sciences Research*, 2: 3–9.
- Gwee, K.A., Ghosha, U.C., Gonlachanvit, S., Chua, A.S.B., Myung, S.J., Rajindrajith, S., Patcharatrakul, T., Choi, M.G., Wu, J.C., Chen, M.H., Gong, X.R., Lu, C.L., Chen, C.L., Pratap, N., Abraham, P., Hou, X.H., Ke, M., Ricafort-Campos, J.D., Syam, A.F. and Abdullah, M. (2013). Primary care management of chronic constipation in Asia: The ANMA Chronic Constipation Tool. *Journal of Neurogastroenterology and Motility*, 19(2): 149–160.
- Huang, R., Ho, S.Y., Lo, W.S. and Lam, T.H. (2014). Physical activity and constipation in Hong Kong adolescents. *PLoS ONE*, 9(2): 1–5.
- Huang, L., Jiang, H., Zhu, M., Wang, B., Tong, M., Li, H., Lin, M. B. and Li, L. (2017). Prevalence and risk factors of chronic constipation among women aged 50 years and older in Shanghai, China. *Medical Science Monitor*, 23: 2660–2667.
- International Institute for Population Sciences (IIPS) and ICF. (2018). National Family Health Survey (NFHS-4), 2015–16, India.
- Jangid, V., Godhia, M., Sanwalka, N. and Shukla, A. (2016). Water intake, dietary fibre, defecatory habits and its association with chronic functional constipation. *Current Research in Nutrition and Food Science*, 4(2): 90–95.
- Karabudak, E., Koksall, E. and Macit, M. (2019). The relationship between body weight, fiber and fluid intake status and functional constipation in young adults. *Nutrition and Food Science*, 49: 129–140.
- Kaur, N., Kumar, N. and Agarwal, S. (2016). Relationship between fast food consumption and health of late childhood. *International Journal of Research-Granthaalayah*, 4(6): 72–81.
- Lewis, S.J. and Heaton, K.W. (1997). Stool form scale as a useful guide to intestinal transit time. *Scandinavian Journal of Gastroenterology*, 32(9): 920–924.
- Lim, Y.J., Rosita, J., Chieng, J.Y. and Hazizi, A.S. (2016). The prevalence and symptoms characteristic of functional constipation using Rome III diagnostic criteria among tertiary education students. *PLoS ONE*, 11(12): e0167243.
- Lindberg, G., Hamid, S., Malfertheiner, P., Thomsen, O., Fernandez, L.B., Goh, K.L., Tandon, R., Fedail, S., Wong, B., Khan, A., Krabshuis, J. and Mair, A.L. (2010). World Gastroenterology Organisation Global Guidelines Constipation: a global perspective. *Journal of Clinical Gastroenterology*, 45(9):483–487.
- Longvah, T., Ananthan, R., Bhaskarchary, K. and Venkaiah, K. (2017). Indian Food Composition Tables. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
- Pecora, P., Suraci, C., Antonelli, M., De Maria S. and Marrocco, W. (1981). Constipation and obesity: a statistical analysis. *Bollettino- Societa Italiana Biologia Sperimentale*, 57: 2384–2388.
- Pourhoseingholi, M.A., Kaboli, S.A., Pourhoseingholi, A., Moghimi-Dehkordi, B., Safaee, A., Mansoori, B.K., Habibi, M. and Zali, M.R. (2009). Obesity and functional constipation; a community-based study in Iran. *Journal of Gastrointestinal and Liver Diseases*, 18: 151–155.
- Rajput, M. and Saini, S.K. (2014). Prevalence of constipation among the general population: A

- community-based survey from India. *Gastroenterology Nursing*, 37(6): 425–429.
- Raghuvanshi, R.S. and Mittal, M. (2014). Food nutrition and diet therapy. New Delhi: Westville Publication House.
- Srinivas, M., Srinivasan, V., Jain, M., Rani Shanthi, C.S., Mohan, V. and Jayanthi, V. (2019). A cross-sectional study of stool form (using Bristol stool chart) in an urban South Indian population. *Journal of Gastroenterology and Hepatology*, 3(6): 464–467.
- Vibhute, N., Baad, R., Belgaumi, U., Kadashetti, V., Bommanavar, S. and Kamate, W. (2018). Dietary habits amongst medical students: An institution-based study. *Journal of Family Medicine and Primary Care*, 7(6): 1464.
- World Health Organization. (2004). Appropriate body mass index for Asian populations and its implications for policy and intervention studies. *Lancet*, 363: 157-163.
- World Health Organization. (2011). Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. World Health Organization.
- World Health Organization. (2017). WHO STEPS Surveillance Manual: The WHO STEP wise approach to non-communicable disease risk factor surveillance. Geneva, Switzerland.

Received: August 6, 2020

Accepted: November 20, 2020