ORIGINAL ARTICLE

Determination of the Mean Daily Stool Weight, Frequency of Defecation and Bowel Transit Time: Assessment of 1000 Healthy Subjects

Seyed Mohammad Kazem Hosseini Asl MD•*, Seyed Davood Hosseini MD**

**Department of Internal Medicine, **Department of Pathology, Shahr-e Kord University of Medical Sciences, Shahr-e Kord, Iran*

- **Abstract**

Background-Stool weight, frequency of defecation and transit time are all indices having a close relation with the quality and quantity of ones diet. The average diet in Iran has significant differences with that of western diet. Therefore, it is assumed that the above-mentioned variables follow specific norms which must be studied more accurately in Iran.

Methods-A total of 1000 healthy Iranian subjects residing in the region of Shahr-e Kord, central Iran, were selected from the attendants to some urban and rural health centers . After providing the necessary information about the procedure of the study, they were requested to collect a 24- or 48- hour stool specimen in some special covered containers. The beginning and the end of the procedure was timed with carmine and activated charcoal as stool markers. At the end of the period, the collected stool was weighted and other required variables were obtained via questionnaire. The SPSS software, version 7.5, was used for analyzing the data by regression analysis and *t-test.*

Results-The mean daily stool weight of the population under study was estimated to be 349±131g. On the average, the frequency of defecation was 1.5 times a day and the transit time was estimated to be around 12.5 hours using carmine and activated charcoal as markers. Stool weight had a significant correlation with four variables namely, male gender, higher body weight, higher age and amount of bread consumed in the daily diet. Moreover, increased frequency of defecation had a significant relation with decreased transit time using charcoal, higher body weight and higher daily stool weight.

Conclusion-As compared to western communities who usually consume a low fiber and high fat diet, the Iranian population in our study had higher stool weight, higher frequency of defecation and shorter transit time probably due to their unique high fiber and low fat diet.

Keywords • Stool weight • transit time • defecation frequency

Introduction

In a healthy person, stool weight depends mainly on the quality and quantity of the diet.[1] In the majority of cases, men and those with larger bodies ingest more food.

Therefore, body weight and sex basically are presumed to be related to the individual's mean daily stool weight. On the other hand, the quality of diet is also determinant, i.e. a high fiber diet results in an increase in the daily stool weight and a high fat diet[2] leads to a decrease in the daily stool weight.

Frequency of defecation is defined as the number of times a person defecates in a day or a week.[3] Due to the high fiber content in the average Iranian diet, the frequency of defecation is more in Iranians as compared to people in industrialized countries with a low fiber diet.[4,5] The frequency of defecation is in accordance with the transit time; the faster the food passes through the bowel, the earlier it reaches the rectum and therefore defecation occurs more frequently. In population with a prolonged transit time, the waste products of several sessions of food intake must accumulate to produce defecation.

The aim of this study was to determine the mean daily stool weight, mean frequency of defecation,

bowel transit time (using carmine and activated charcoal as indicators), as well as to assess the relation between these three parameters and other epidemiological variables (such as age, sex[6], body weight) and diet. As far as we know, no study has addressed stool weight and transition time in Iranian subjects.

Patients and Methods

The specimens under study were randomly obtained from individuals attending urban and rural health centers of Shahr-e Kord, central Iran. The subjects with acute or chronic physical or mental disease were excluded. Also healthy individuals who had consumed any form of medication during the previous month, or had a history of long-term use of medication were excluded. A sample size of 1,000 was considered adequate for completion of our sampling and the specimens were obtained equally from urban and rural areas.

The study procedure was fully explained to all persons fulfilling the selection criteria who visited the health centers. After obtaining consent for the performance of all stages of the study, three interview sessions were planned for each subject.

In the first session, one capsule containing 300 mg carmine was taken orally in the presence of the researcher. These capsules, which were sterilized in the autoclave, acted as the first marker. The exact time of carmine ingestion was recorded and the subject was informed about his stool discoloration in the following hours or days. He was then requested to note the exact date and time of this discoloration, after which he must begin to collect his faeces in a special covered container, which was provided for this purpose. In addition, he was told to keep the container in a cool place (preferably in the refrigerator) and to continue stool collection even after normalization of color.

The subjects attended the health center, for a second visit, 24 or 48 hours after the initial visit according to patients' choice and convenience. This time, they were given 3 capsules containing a sum of1 gram of activated charcoal . They were also informed about the black discoloration of the stool by the capsules. Again, the subjects were requested to record the exact date and time of stool discoloration. After this second discoloration, specimen collection was discontinued and all the specimens collected were handed over to laboratory for weighting and investigation for the presence of WBC, RBC, ova and parasites.

During the third interview, in addition to obtaining the collected stool, a questionnaire was completed by the researchers. In this questionnaire, in addition to obtaining preliminary demographic data, information regarding the dietary habits including the amount of bread consumed daily and frequency of bowel movements were obtained.

The extracted data, were entered into a data bank designed by SPSS software version 7.5 and the necessary tests were performed in order to assess the factors determining stool weight and transit time.

Results

According to the study design, an equal ratio of city to village inhabitants and male to female subjects participated in the study. Of the 1000 individuals, 524 people had collected a 24-hour specimen, and the remaining 476 people had collected a 48-hour specimen. The mean age was approximately 28 years with a range of 15-70 years The mean body weight of the subjects was found to be 63.4 kg. However, height was not measured thus body mass index (BMI) was not calculated.

The mean transit time using carmine and activated charcoal was 12.46 ± 4.58 hours and 12.63 ± 5.07 hours, respectively. On the other hand the frequency of defecation was 1.52±0.92 times per day or

three times every two days. In addition, 81.7% of the individuals defecated once or twice a day. On the whole, the mean stool weight of the specimens was 349±131 g with a median of 320 g.

Among the subjects under study, the stool examination detected WBC and RBC in 10% and 4.8% of cases, respectively. Stool examination was positive for ova and parasites in 28.2% of cases and positive for occult blood in 17.5% of the cases in the study.

Daily stool weight

A significant relationship was found between the mean 24 hour stool weight and four variables namely:

1. Sex As compared to women, men had a significantly higher stool weight ($p<0.001$, $F=221$). The mean 24 hour stool weight was 407.66 ± 133.27g and 294.65 ± 102.14 g in men and women respectively, which was significantly higher in men.

2. Body weight: Stool weight was found to increase with increasing body weight ($p<0.001$, $F=160$). Regression analysis showed a close correlation between the two variables ($r=0.390$). Figure 1 shows that stool weight increased by 42.4 g for every 10 kg increase in body weight.

3. Age: With increasing age, stool weight also increased. Regression analysis showed a significant correlation between age and daily stool weight ($r=0.243$, $p<0.001$). Stool weight increased by 27.1 g for every 10 years increase in age. The correlation between these two variables was also proved by the ANOVA test ($p<0.001$, $F=61$) (Fig. 1).

4. Bread: The bread provided by the majority of bakeries in Shahr-e Kord is made of white flour (deficient in fiber). The ANOVA test showed that stool weight increases with increased use of bread ($p<0.05$, $F=4.7$). However, the correlation between these two variables was not very strong ($r=0.071$). Each bread weighs about 200 g in 97% of cases. The equation relating these two variables showed that the daily stool weight increased by 13 g for every 200 g of bread consumed.

Frequency of defecation

The frequency of defecation had no significant relation with age, sex, use of bread, pulses, dairy products, fruit, meat or rice, but showed an increase with increasing body weight.

In this study, a significant correlation was also found between stool weight and frequency of defecation ($r=0.225$, $F=49.8$, $p<0.001$), thus, stool weight increased with increasing frequency of defecation.

Discussion

Stool weight depends mainly on the presence of water, bacteria[7] and fiber in the stool. Bacteria are responsible for half of the dry fecal weight.[8] On the other hand, unabsorbed water results in an increase in stool weight. Burkitt et al drew attention to the association between stool weight, colonic transit time and the amount of dietary fiber.[1] Higher stool weight is also associated with shorter transit time and higher fiber content of the stools.[9,10]

The Iranian diet has a fairly high fiber content which can result in an increased mean daily stool weight and frequency of defecation and shorter transit time.

The results of this study do not necessarily extend to the whole Iranian population but when compared to studies conducted in the West, results differ considerably.[4] The mean daily stool weight

of the subjects in this study was 349 g, with an average of 432 g and 311 g in men and women respectively. This is almost twice the average value calculated in western societies.[4]

Fruit and vegetables had no effect in increasing the stool weight, but were apparently effective in increasing the mean stool weight of the population under study as compared to that of the western population.[11,12] This study also showed the role of bread[13] (even without fiber) in increasing stool weight. It seems that the reason for the strong correlation between stool weight and use of bread (and not with other food substances), is the fact that bread constitutes the main diet of the population under study and its assessment was performed more accurately. If an accurate and reliable assessment had taken place about other food substances however, it may have been possible that the correlation between use of other food substances and stool weight would have been detected.

In this study, although a significant relation was found to exist between the use of meat and increasing stool weight, we cannot rely on this finding due to the inaccurate, subjective measurement of meat intake. The mean frequency of defecation in the sample under study was 1.5 times a day or three times every two days. It seems that the frequency of defecation is higher among Iranians as compared to western populations.[14] A direct relation also existed between increasing stool weight and shortening of the transit time. The transit time was estimated to be around 12.5 hours using charcoal and carmine, which is shorter than that found in studies conducted in the west.

However, this study did have some inherent shortcomings which should be noticed. It would have been better if the relation between stool weight was assessed with a better index namely "BMI" which is probably a better representative of the human physique. Assessment of the diet ought to have been performed more accurately and objective and quantitative measures should have been applied. This research should be regarded as a preliminary study and future inquiries with a more accurate design should be performed.

Acknowledgment

With utmost thanks to the Health Deputy of the Ministry of Health and Medical Education for their cooperation in performing this study and to Dr. Rafiian for his advice and assistance.

References

1. Burkitt DP, Walker AR, Painter NS. Effect of dietary fiber on stools and transit times and it's role in the causation of disease. *Lancet*.1972 ; **30:** 1408-12.
2. Kurasawa S, Haack VS, Marlett JA. Plant residue and bacteria as bases for increased stool weight accompanying consumption of higher dietary fiber diets. *J Am Coll Nutr*.2000 ; **19:** 426-33.
3. Probert CJ, Emmett PM, Heaton KW. Intestinal transit time in the population calculated from self made observations of defection. *J Epidemiol Community Health*.1993 ; **47:** 331-3.
4. Cummings JH, Bingham SA, Heaton KW, Eastwood MA. Fecal weight, colon cancer risk, and dietary intake of non-starch polysaccharides. *Gastroenterology*.1992 ; **103:** 1783-9.
5. Williams CL, Bsllella MC, Strobino BA, Boccia L, Campanaro L. Plant stand ester and bran fiber in childhood: effects on lipids stool weight and stool frequency in preschool children. *J Am Coll Nutr*. 1999; **18:** 572: 81.
6. Degen LP, Phillips SF. Variability of gastrointestinal transit in healthy women and men. *Gut.* 1996; **39:** 299-305.
7. Tomlin J, Read NW. The relation between bacterial degradation of viscous polysaccharides and stool output in human beings. *Br J Nutr*.1988 ; **60:** 467-75.
8. Stephen AM, Wiggins HS, Cummings JH. Effect of changing transit time on colonic microbial metabolism in man. *Gut*.1987 ; **28:** 601-9.
9. Gowgill GR, Anderson WE. Laxative effects of wheat bran and washed bran in healthy men. *JAMA.* 1932; **98:** 1866-71.
10. Beyer PL, Flynn MA. Effect of high and low fiber diet on human feces. *J Am Diet Assoc*.1978 ; **72:** 271-7.
11. Davies GJ, Crawder M, Reid B, Dickerson JW. Bowel function measurements of individuals with different eating patterns. *Gut.* 1986; **27:** 164-9.
12. Van Dokkum W, Pikaar NA, Thissen JT. Physiological effects of fiber-rich type of bread.2. Dietary fiber from bread: digestibility by the intestinal microflora and water-holding capacity in the colon of human subjects. *Br J Nutr.* 1983; **50:** 61-74.
13. Stephen AM, Wiggins HS, Englyst HN, et al. The effect of age, sex and level of intake of dietary fiber from wheat on large-bowel function in thirty

subjects. *Br J Nutr*.1986 ; **56:** 349-67.

14. Danquechin-Doval E, Barbieux JP, Picon L, Alison D, Codjovi P, Rouleau P. Simplified measurement of colonic transit time by one radiography of the abdomen and a single type of marker. Normal valves in 82 volunteers related to the sexes. *Gastroenterol Clin Biol*.1994 ; **18:** 141-4.

AIM Home|Table of Contents