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# Prevalence and Risk Factors of Chronic Constipation Among Women Aged 50 Years and Older in Shanghai, China

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**Background:** Chronic constipation (CC) is a major public health problem worldwide, especially in elderly women. This study aimed to investigate the prevalence and risk factors of CC among women aged 50 years and older in Shanghai, China.





**Material/Method:** A cross-sectional survey was conducted on 1950 women aged 50 years and older, randomly sampled in Yangpu District of Shanghai from April to October 2015. Information on demographic characteristics, lifestyle habits, medical history, and defecation situation was collected through in-person interviews. CC was defined according to Rome III criteria. The data were analyzed by chi-square test and multiple logistic regression analysis.

**Results:** The response rate to the survey was 80.4%. Of the 1568 participants, 77 were diagnosed with CC, with a prevalence of 4.9%. Moreover, the prevalence increased with advancing age. Multiple logistic analyses showed that body mass index (BMI)  $\geq 25.0$  kg/m<sup>2</sup>, non-manual occupation, premenopausal period, no delivery history, poor sleep quality, meat-based diet, and less physical exercise were significant risk factors for CC in the population of women aged 50 years and older.

**Conclusions:** CC was a common health problem among women aged 50 years and older in Shanghai, and the prevalence was positively associated with BMI  $\geq 25.0$  kg/m<sup>2</sup>, non-manual occupation, premenopausal period, no delivery history, poor sleep quality, meat-based diet, and less physical exercise. Further studies are needed to identify the risk factors and potential interventions for CC.

**MeSH Keywords:** **Constipation • Prevalence • Risk Factors • Women**

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## Background

Constipation is characterized by unsatisfactory defecation that results from infrequent stools, difficult stool passage, or both [1]. Various studies have indicated that chronic constipation (CC) has a major negative impact on quality of life, affecting both physical and emotional well-being [2,3]. In recent years, CC has become a common health problem worldwide, resulting in a major economic and social burden [4,5]. According to reports from Western countries, the prevalence of CC in the general population ranges from 2% to 28%, with an increasing trend over years [1,6,7]. Moreover, severe constipation is frequently observed in elderly women, with rates of 2 to 3 times higher than that of their male counterparts [6,8]. CC is a heterogeneous disorder, with multiple causes, including dysfunction of intestinal motility, visceral sensitivity, anorectal musculature, and the enteric nervous system [9]. In addition, many factors may also contribute to the development of CC, such as age, gender, physical activity, dietary habits, medication use and psychological parameters [6,10].

However, CC has so far received much less investigative attention in Asian populations as compared with Western populations. What's worse, many people in Asian countries, especially the elderly and women, have a relatively poor knowledge of how to prevent CC [11]. Therefore, it is extremely important to know the magnitude of the problem in this population, as well as the associated factors involved, so that preventive measures can be applied. The purpose of the present study was to estimate the prevalence of CC and its associated risk factors among women aged 50 years and older in Shanghai, China.

## Material and Methods

### Study design and population

This study was a population-based, cross-sectional field survey among women aged 50 years and older and living in the communities of Yangpu District, Shanghai, China. To select a representative sample of the population, a stratified multi-stage clustered probability sampling design was applied [12]. A total of 1950 eligible women from 8 communities were contacted to participate in this survey from April to October 2015. The survey was conducted at participations' homes by well-trained interviewers using a structured questionnaire, which included demographic characteristics, lifestyle habits, medical information, and defecation situation. Fasting blood glucose (FBG) and anthropometric measurements, including current weight, height, and circumferences of the waist and hips, were also taken by using a standard protocol. This study was conducted according to the principles of the Declaration of Helsinki [13] and was approved by the Research Ethics

Committee of Yangpu Hospital. Written informed consent was obtained from all participants.

### Contents of survey

The survey consisted of 4 parts: (1) General information, which included age, body mass index (BMI), waist-to-hip ratio (WHR), FBG, marital status, educational level, current/past occupation, menstrual situation, and delivery history. BMI was defined as weight in kilograms divided by height in meters squared, and participants were categorized as normal weight ( $<25.0 \text{ kg/m}^2$ ) or overweight/obese ( $\geq 25.0 \text{ kg/m}^2$ ) [14]. WHR was defined as waist circumference divided by hip circumference, and women with a WHR  $>0.85$  were classified as having central obesity [15]; (2) Lifestyle habits, which included smoking and alcohol-drinking history, self-rated sleep quality, diet structure, frequencies of fruit consumption, and physical exercise. A positive smoking history was defined as smoking more than 5 cigarettes per week for at least 1 year, and a positive drinking history was defined as drinking more than 35 g of alcohol at least twice a week. Self-rated sleep quality was determined as a response to the question "Would you say that, in general, your sleep quality is good, fair, or poor?" Responses were dichotomized into good/fair and poor. Meat-based diet was defined as a consumption of raw vegetables  $<100 \text{ g/day}$ , a ratio of refined grain products to whole grain products  $>0.95$  and a consumption  $>105 \text{ g/week}$  of meat products or  $>300 \text{ g/week}$  of meat. Adequate fruit consumption was defined as 2 or more servings of fruit (300 g/serving) per day, and participants were grouped into either  $\geq 4 \text{ days/week}$  or  $\leq 3 \text{ days/week}$ . Regular physical exercise was defined as participation in any physical activity that was performed long enough to sweat at least 3 times a week; (3) Medical information was collected by asking "Has a doctor or other health professional ever told you that you have [disease]?" and "Have you ever had abdominal and/or gynecological surgery?" Disease types were deemed positive according to self-report: hypertension, cardiovascular disease, cerebrovascular disease, hyperlipidemia, steatohepatitis, diabetes, cholelithiasis, and thyroid disease; and (4) CC was defined according to Rome III criteria with the following constipation judgment indicators: defecation less than 3 times per week, stool weight of less than 35 g/d, dry and hard stool, difficulty in defecating during more than 25% of evacuation attempts, and symptom onset over 6 months [16].

### Statistical analysis

Statistical analyses were performed by SPSS software (SPSS 19.0, IBM, Chicago, IL). The prevalence and 95% confidence intervals (CIs) of CC were calculated for the entire population and the population by age group. Chi-square and *t* tests were used to analyze the differences in patient characteristics and outcomes. Multivariable logistic regression analyses were utilized to

**Table 1.** Prevalence of chronic constipation by age group.

	Study population	CC	Prevalence, % (95% CI)
Total	1568	77	4.9 (3.8–6.0)
Age (years)			
50–59	572	26	4.5 (2.8–6.3)
60–69	653	32	4.9 (3.2–6.6)
70–79	226	12	5.3 (2.4–8.2)
≥80	117	7	6.0 (1.7–10.3)

CC – chronic constipation; CI – confidence interval.

identify risk factors for CC while controlling potential confounders [17]. The odds ratio (OR) and 95%CI were estimated for each factor. A *P* value of <0.05 was considered statistically significant.

## Results

### Prevalence and characteristics of CC

Of 1950 eligible women, 382 refused to participate, and finally 1568 (80.4% response rate) were recruited and completed the survey. Among them, 77 women were diagnosed with CC based on Rome III criteria, with a prevalence of 4.9% (95% CI 3.8–6.0%). Moreover, the prevalence of CC increased with advancing age, from 4.5% in the 50–59 years age group to 6.0% in the ≥80 years age group (Table 1). However, no significant difference in age distribution was observed between individuals with and without CC (*P*=0.573). Compared with the non-CC group, women with CC were more likely to be overweight/obese (*P*=0.046), engage in non-manual work (*P*=0.009), and eat meat-based diets (*P*=0.013), but less likely to perform physical exercise (*P*=0.011). In addition, they were more likely to be in premenopausal period (*P*<0.001), have no delivery history (*P*=0.001), and suffer poor sleep quality (*P*<0.001) (Table 2).

### Risk factors associated with CC

Multivariate logistic regression analyses were conducted to evaluate the association of CC with each variable after adjustment for potential confounders (Table 3). The results showed that BMI ≥25.0 kg/m<sup>2</sup> (OR=2.34, 95% CI 1.34–4.08), non-manual occupation (OR=2.41, 95% CI 1.33–4.35), premenopausal period (OR=4.86, 95% CI 2.31–10.24), no delivery history (OR=6.91, 95% CI 2.47–19.31), poor sleep quality (OR=2.99, 95% CI 1.79–4.99), meat-based diet (OR=2.29, 95% CI 1.01–5.19), and less physical exercise (OR=1.65, 95% CI 1.02–2.70) were significant risk factors for CC in the population of women aged 50 years and older, whereas no significant association was detected for age, educational level, or diabetes.

## Discussion

In this study, we found that the prevalence of CC among women aged 50 years and older in Shanghai was 4.9%, and the prevalence was positively associated with BMI ≥25.0 kg/m<sup>2</sup>, non-manual occupation, premenopausal period, no delivery history, poor sleep quality, meat-based diet, and less physical exercise. To our knowledge, this is the first study specifically designed to estimate the epidemiology of CC among women aged 50 years and older in China.

CC is a major public health problem worldwide, especially in elderly women. However, the reported prevalence of CC varies widely between studies, which may be mainly attributed to geographical factors, differences in the definitions used, and the age distributions of study populations [18,19]. Our study cohort consisted of women aged 50 years and older in Shanghai, China, a population in which the prevalence of CC has not been studied in depth previously. According to Rome III criteria, the prevalence of CC was found to be 4.9% in this study population. This finding is substantially lower compared to the prevalence reported for many elderly female populations in Western countries (12–34%) [1,20–22]. The Rome IV criteria were published in 2016 and are similar to Rome III but further emphasize the subtypes of constipation [23]. We also compared the Rome III and Rome IV criteria for the diagnosis of CC, and found the same prevalence in our study population. In addition, consistent with the previous studies [24,25], we found that the prevalence of CC increased with advancing age.

In this study, we also evaluated the potential risk factors for CC. Age effects on the prevalence of constipation have been frequently reported in previous studies [18]. Our study data showed that the prevalence of CC increased with age, but no significant association was identified in the multiple logistic analyses, suggesting that age might not be a major risk factor for constipation in this study population. Poor lifestyle habits and psychological well-being have also been suggested as

**Table 2.** Sociodemographics and medical information of individuals with and without chronic constipation.

Variables	CC (n=77)	Non-CC (n=1491)	P value
Age (years)			
Median (Range)	62 (50-85)	62 (50-91)	0.573
BMI (kg/m <sup>2</sup> )			
<25.0	43 (55.8%)	1005 (67.4%)	
≥25.0	34 (44.2%)	486 (32.6%)	<b>0.046</b>
WHR			
≤0.85	36 (46.8%)	602 (40.4%)	
>0.85	41 (53.2%)	889 (59.6%)	0.285
Marital status			
Married	64 (83.1%)	1309 (87.8%)	
Single/divorced/widowed/separated	13 (16.9%)	182 (12.2%)	0.286
Educational level			
<High school	39 (50.6%)	868 (58.2%)	
≥High school	38 (49.4%)	623 (41.8%)	0.195
Current/past occupation			
Manual	57 (74.0%)	1275 (85.5%)	
Non-manual	20 (26.0%)	216 (14.5%)	<b>0.009</b>
Menstrual situation			
Postmenopausal	64 (83.1%)	1428 (95.8%)	
Premenopausal	13 (16.9%)	63 (4.2%)	<b>&lt;0.001</b>
Delivery history			
Yes	70 (90.0%)	1465 (98.3%)	
No	7 (9.1%)	26 (1.7%)	<b>0.001</b>
Smoking history			
Yes	4 (5.2%)	42 (2.8%)	
No	73 (94.8%)	1449 (97.2%)	0.281
Alcohol-drinking history			
Yes	7 (9.1%)	71 (4.8%)	
No	70 (90.9%)	1420 (95.2%)	0.101
Self-rated sleep quality			
Good/fair	45 (58.4%)	1175 (78.8%)	
Poor	32 (41.6%)	316 (21.2%)	<b>&lt;0.001</b>
Meat-based diet			
No	68 (88.3%)	1421 (95.3%)	
Yes	9 (11.7%)	70 (4.7%)	<b>0.013</b>
Frequency of fruit consumption			
≥4 days/week	50 (64.9%)	968 (64.9%)	
≤3 days/week	27 (35.1%)	523 (35.1%)	1.000
Frequency of physical exercise			
≥3 days/week	38 (49.4%)	957 (64.2%)	
≤2 days/week	39 (50.6%)	534 (35.8%)	<b>0.011</b>

**Table 2 continued.** Sociodemographics and medical information of individuals with and without chronic constipation.

Variables	CC (n=77)	Non-CC (n=1491)	P value
Hypertension			
Yes	28 (36.4%)	649 (43.5%)	0.239
No	49 (63.6%)	842 (56.5%)	
Cardiovascular disease			
Yes	14 (18.2%)	375 (25.2%)	0.179
No	63 (81.8%)	1116 (74.8%)	
Cerebrovascular disease			
Yes	7 (9.1%)	139 (9.3%)	1.000
No	70 (90.9%)	1352 (90.7%)	
Hyperlipidemia			
Yes	11 (14.3%)	275 (18.4%)	0.372
No	66 (85.7%)	1216 (81.6%)	
Steatohepatitis			
Yes	18 (23.4%)	370 (24.8%)	0.790
No	59 (76.6%)	1121 (75.2%)	
Diabetes			
Yes	14 (18.2%)	205 (13.7%)	0.310
No	63 (81.8%)	1286 (86.3%)	
FPG (mmol/L)			
<7.0	66 (85.7%)	1351 (90.6%)	0.156
≥7.0	11 (14.3%)	140 (9.4%)	
Cholelithiasis			
Yes	10 (13.0%)	244 (16.4%)	0.527
No	67 (87.0%)	1247 (83.6%)	
Thyroid disease			
Yes	8 (10.4%)	187 (12.5%)	0.606
No	69 (89.6%)	1304 (87.5%)	
Abdominal and/or gynecological surgery			
Yes	23 (29.9%)	389 (26.1%)	0.507
No	54 (70.1%)	1102 (73.9%)	

CC – chronic constipation; BMI – body mass index; WHR – waist-to-hip ratio; FPG – fasting blood glucose.

important risk factors for CC [10,18]. These were evident in our study as being overweight/obese, less physical exercise, meat-based diet, and poor sleep quality were found to contribute significantly to CC. Moreover, we found that women in premenopausal period or with no delivery history appeared to be more likely to suffer from constipation, which might be associated with the fluctuations in female sex hormones and emotions [26,27]. We also observed that, compared with manual workers, non-manual workers tended to have a higher risk for CC. A possible explanation for this phenomenon was that they had a more sedentary lifestyle and greater mental

stress [28,29]. However, in our study, no significant association with CC was detected for educational level or diabetes, which had been reported in some studies [30,31]. Given that the pathophysiology of constipation is not clearly identified as yet, the causes for these differences remain to be elucidated. In addition to these factors, medication use may also be implicated in the development of constipation. Many drug classes, including diuretics, antidepressants, aluminum-containing antacids, antihistamines, opioids, antispasmodics and anticonvulsants, have been reported to be associated with a nearly 2- to 3-fold increased risk of CC [32]. Unfortunately, because

**Table 3.** Multivariate logistic analysis of risk factors associated with chronic constipation.

Variables	OR (95% CI)	P value
Age (years)		
<70	1 (reference)	
≥70	1.39 (0.72–2.66)	0.326
BMI (kg/m <sup>2</sup> )		
<25.0	1 (reference)	
≥25.0	2.34 (1.34–4.08)	<b>0.003</b>
WHR		
≤0.85	1 (reference)	
>0.85	0.61 (0.36–1.04)	0.067
Marital status		
Married	1 (reference)	
Single/divorced/widowed/separated	1.39 (0.70–2.76)	0.347
Educational level		
<High school	1 (reference)	
≥High school	1.12 (0.66–1.91)	0.675
Current/past occupation		
Manual	1 (reference)	
Non-manual	2.41 (1.33–4.35)	<b>0.004</b>
Menstrual situation		
Postmenopausal	1 (reference)	
Premenopausal	4.86 (2.31–10.24)	<b>&lt;0.001</b>
Delivery history		
Yes	1 (reference)	
No	6.91 (2.47–19.31)	<b>&lt;0.001</b>
Smoking history		
Yes	1 (reference)	
No	1.10 (0.34–3.60)	0.874
Alcohol-drinking history		
Yes	1 (reference)	
No	0.56 (0.23–1.38)	0.208
Self-rated sleep quality		
Good/fair	1 (reference)	
Poor	2.99 (1.79–4.99)	<b>&lt;0.001</b>
Meat-based diet		
No	1 (reference)	
Yes	2.29 (1.01–5.19)	<b>0.048</b>
Frequency of fruit consumption		
≥4 days/week	1 (reference)	
≤3 days/week	0.92 (0.55–1.55)	0.752
Frequency of physical exercise		
≥3 days/week	1 (reference)	
≤2 days/week	1.65 (1.02–2.70)	<b>0.043</b>



**Table 3 continued.** Multivariate logistic analysis of risk factors associated with chronic constipation.

Variables	OR (95% CI)	P value
Hypertension		
Yes	1 (reference)	
No	1.48 (0.84–2.61)	0.171
Cardiovascular disease		
Yes	1 (reference)	
No	1.61 (0.82–3.18)	0.169
Cerebrovascular disease		
Yes	1 (reference)	
No	1.01 (0.41–2.53)	0.979
Hyperlipidemia		
Yes	1 (reference)	
No	1.43 (0.70–2.92)	0.323
Steatohepatitis		
Yes	1 (reference)	
No	1.09 (0.58–2.07)	0.784
Diabetes		
Yes	1 (reference)	
No	0.66 (0.30–1.47)	0.313
FPG (mmol/L)		
<7.0	1 (reference)	
≥7.0	1.32 (0.56–3.10)	0.531
Cholelithiasis		
Yes	1 (reference)	
No	1.47 (0.70–3.11)	0.314
Thyroid disease		
Yes	1 (reference)	
No	1.45 (0.66–3.21)	0.357
Abdominal and/or gynecological surgery		
Yes	1 (reference)	
No	0.77 (0.45–1.35)	0.364

CC – chronic constipation; BMI – body mass index; WHR – waist-to-hip ratio; FPG – fasting blood glucose; OR – odds ratio; CI – confidence interval.

of the self-reported nature of the survey, we failed to acquire sufficient data about medication use and estimate the effect of previous treatment for constipation.

Some other limitations of this study should be acknowledged. First, there was limited generalizability of the findings as the sample was recruited from only 1 district of Shanghai. Second, most variables investigated were self-reported; hence, the potential for recall bias was inevitable. In addition, due to the cross-sectional design, a causal relationship between CC and risk factors could not be determined. Hence, further population-based studies with larger sample sizes and long-term

follow-up are required to identify the risk factors and potential interventions for CC.

## Conclusions

Our study results suggest that CC is a common gastrointestinal disorder among women aged 50 years and older in Shanghai, with a prevalence of 4.9%. Moreover, BMI ≥25.0 kg/m<sup>2</sup>, non-manual occupation, premenopausal period, no delivery history, poor sleep quality, meat-based diet, and less physical exercise were the potential risk factors for CC in elderly women.

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