

# ASSESSMENT OF GASTROINTESTINAL SYMPTOMS AMONG WORKING WOMEN USING THE GASTROINTESTINAL SYMPTOM RATING SCALE (GSRS)

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**Abstract:** Gastrointestinal (GI) symptoms are common among working women and may be influenced by dietary habits and lifestyle factors. The present study aimed to assess GI symptom severity using the Gastrointestinal Symptom Rating Scale (GSRS) and examine its association with selected dietary factors. A descriptive cross-sectional study was conducted among 346 working women. GI symptoms were assessed using the GSRS, which includes five domains: reflux, abdominal pain, indigestion, diarrhoea, and constipation. Dietary factors such as frequency of spicy food consumption and daily water intake were collected using a structured questionnaire. Spearman's correlation analysis was performed to determine associations. Participants presenting with symptoms received individualized dietary counseling. The majority of participants reported mild gastrointestinal symptoms, with no cases of very severe discomfort. Domain-wise analysis showed higher mean scores for indigestion ( $3.07 \pm 1.25$ ) and reflux ( $3.02 \pm 1.21$ ), indicating greater prevalence of upper GI symptoms, while diarrhoea ( $1.46 \pm 0.82$ ) and constipation ( $1.49 \pm 0.88$ ) were less severe. A strong positive correlation was observed between spicy food consumption and GSRS scores ( $\rho = 0.678$ ,  $p < 0.001$ ), whereas water intake showed a significant negative correlation ( $\rho = -0.254$ ,  $p < 0.001$ ). GI symptoms among working women were predominantly mild, with upper GI disturbances being more common. Dietary habits significantly influenced symptom severity, highlighting the need for targeted nutritional interventions.

**Keywords:** Gastrointestinal symptoms, GSRS, working women, dietary factors, spicy food, water intake.

## INTRODUCTION

In recent years, women have increasingly entered the workforce due to higher education levels and the need to supplement household income. The estimated metro population of Coimbatore in 2025 is 3,130,260, of which approximately 49.92% (1,562,644) are females, and nearly 468,793 are working women. There is growing concern that working women may be at increased risk of non-communicable diseases such as hypertension, cardiovascular diseases, diabetes mellitus, cancer, and gastrointestinal symptoms including acid reflux, heartburn, and abdominal pain (Salwathura and Ahmed, 2023).

A woman and her health has a significant impact on the health of her offspring. Due to ignorance, work-related stress, or activities at home and at work, many women do not have as much time for self-care and children as non-working women do, despite having greater financial freedom (Gjellestad et al., 2023). Microbial fermentation of fibre with substantial gas production may be the source of symptoms for some people including abdominal discomfort, bloating, distension and flatulence (Hasler, 2006). Fibre-rich foods which may be associated with increased gas production include legumes, pulses, cruciferous vegetables, onions and garlic, however, dairy products and wheat fibre can have a similar effect (Grabitske and Slavin, 2009).

The impact of increased intestinal gas or fluid on the experience of GI symptoms may vary widely and depend on individual perceptions and visceral sensitivity (Marteau and Flourie, 2001). Individuals with IBS report increased symptoms compared to healthy individuals despite the absence of identifiable structural abnormalities or any considerable difference in intestinal gas production (Lee et al., 2017). Although the etiology of IBS is not clear, it is thought that increased visceral sensitivity, altered gut motility, impaired gas handling, carbohydrate malabsorption, the gut microbiota, immune system and gut brain axis all contribute to symptom generation (Enck et al. 2016).

The present study was undertaken to examine the severity of GI symptoms and also to investigate the relationship between

spicy food consumption and severity of gastrointestinal (GI) symptoms among working women.

### METHODOLOGY

Considering the limited evidence in the Indian context, particularly among women exposed to occupational stress, irregular meal patterns, and specific dietary habits, a descriptive study was conducted in Coimbatore. Sample size was calculated using the formula  $n = Z^2 \times p \times (1 - p) / d^2$ , Where  $n$  = required sample size,  $Z$  =  $Z$  value for confidence level (1.96 for 95% confidence),  $p$  = expected prevalence (from previous studies),  $1 - p$  (q) = proportion without the factor,  $d$  = precision or margin of error (usually 5% = 0.05). A total of 346 working women aged 25–50 years, employed for at least one year and willing to participate, were selected for the study. Subjects not willing to participate in the study, and with severe underlying disease conditions were excluded. Data were collected using a structured and pre-tested questionnaire comprising socio-demographic details, dietary patterns, lifestyle practices, medical history, and a 24-hour dietary recall, along with a Food Frequency Questionnaire to assess spicy food intake.

The Gastrointestinal Symptom Rating Scale (GSRS) is a validated 15-item questionnaire designed to assess the severity of gastrointestinal symptoms over the past week, commonly used in research to evaluate conditions like IBS, dyspepsia, and peptic ulcer disease, typically using a 7-point Likert scale, where the scores (1-7) indicate no discomfort to very severe discomfort. Gastrointestinal symptoms were evaluated using the GSRS. Anthropometric measurements such as height and weight were recorded to calculate Body Mass Index (BMI). Primary data collection was carried out after obtaining necessary permissions and informed consent, ensuring confidentiality and anonymity. In addition, a nutrition education module was developed and implemented to enhance awareness regarding healthy dietary practices and GI health, followed by assessment of its impact on GSRS scores. The collected data were analyzed using SPSS software, employing descriptive statistics (frequency and percentage) and inferential tests such as chi-square to determine associations between GI symptoms and selected variables. The study aimed to assess the prevalence and severity of GI symptoms and relationship with spicy food consumption among working women.

### RESULTS AND DISCUSSION

#### 1. Baseline information

The majority of respondents belonged to the 31–40 years age group (36.7%), followed by 41–50 years (31.8%), indicating that middle-aged women formed the dominant age group in the study. Most respondents were married (77.7%) and well educated, with nearly half being postgraduates (45.1%). Occupationally, a higher proportion of participants were engaged in administrative jobs (43.9%), followed by healthcare and allied services (19.7%) and self-employment (16.2%). Regarding income distribution, most belonged to the middle–upper (39.3%) and low–middle (31.8%) income categories, while a small fraction (1.7%) represented the low- income group. The majority of participants resided in urban areas (62.1%), suggesting better access to education, employment, and health facilities.

#### 2. Anthropometric status

The anthropometric status of the study participants was assessed to understand their nutritional profile and identify the prevalence of underweight, normal weight, overweight, and obesity. Body Mass Index (BMI) was used as the criteria for classification. The mean height, weight, and BMI of the participants were  $158.4 \pm 6.2$  cm,  $65.3 \pm 14.8$  kg, and  $24.1 \pm 6.7$  kg/m<sup>2</sup>, respectively.

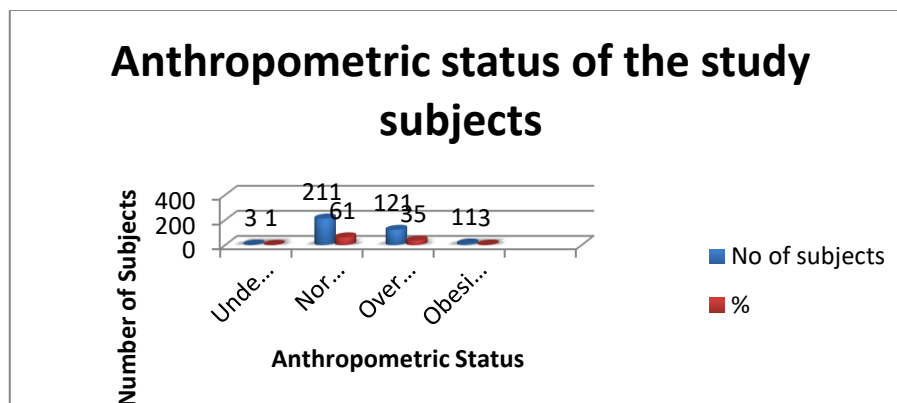


Figure 1. Anthropometric status of the study subjects

From the above figure, the anthropometric profile of the study participants indicates that the majority of subjects (61%) had normal body weight, suggesting an overall acceptable nutritional status in more than half of the population. However, a considerable proportion of participants were found to be overweight (35%) and obese (3%), together accounting for 38% of the sample, which reflects a growing burden of overnutrition. This trend may be attributed to lifestyle factors such as sedentary behavior, irregular meal patterns, and increased consumption of energy-dense foods, including ultra-processed or spicy foods. In contrast, only 1% of the participants were underweight, indicating that undernutrition is relatively less prevalent in this group.

The higher prevalence of overweight compared to obesity suggests that a significant segment of the population is in the early stage of nutritional transition, where timely intervention through dietary modification and lifestyle changes could prevent progression to obesity and associated metabolic complications. These findings highlight the dual burden of malnutrition, with a shift towards overweight and obesity, emphasizing the need for targeted nutrition education and preventive strategies, particularly in populations at risk. The mean waist circumference, hip circumference, and WHR of the participants were  $92.5 \pm 9.4$  cm,  $98.2 \pm 8.7$  cm, and  $0.94 \pm 0.06$ , respectively.

### 3. Dietary habits of the subjects

Dietary pattern analysis revealed that a significant portion of respondents were non-vegetarians (71.7%) and most consumed home-prepared meals (69.4%). Preference for spicy food was observed in 41% of participants, while 38.2% reported no preference and 20.8% consumed it occasionally. The most commonly consumed spicy items were street foods (34.7%) and spicy curries (29.2%), followed by pickles (21.1%) and chili sauces (15%). Spicy foods were most frequently included in lunch (46.2%), and consumption frequency showed that 24% consumed them 2–3 times per week and 16.8% consumed them daily. Low water intake (<1.5L) was recorded by 48% of the subjects.

#### 3.1 Nutrient intake of the study subjects

Table-1  
Nutrient Intake of the Study Participants

Nutrient	RDA (2020)	Mean Intake (Mean $\pm$ SD)
Energy (kcal)	1900	1685.42 $\pm$ 412.36
Carbohydrate (g)	275	210.78 $\pm$ 65.42
Protein (g)	55	46.31 $\pm$ 9.78
Fat (g)	25	38.56 $\pm$ 8.24
Fibre (g)	30	15.83 $\pm$ 6.41

The dietary assessment of the study participants reveals notable deviations from the recommended dietary allowances (RDA). The mean energy intake (1685.42 kcal) was lower than the recommended 1900 kcal, indicating a moderate energy deficit, which may be associated with irregular meal patterns commonly observed among working women. Similarly, carbohydrate intake (210.78 g) was also below the recommended level, suggesting insufficient consumption of staple energy-giving foods. Protein intake (46.31 g) was found to be inadequate compared to the RDA of 55 g, which may have implications for muscle maintenance, immunity, and overall health. In contrast, fat intake (38.56 g) exceeded the recommended 25g, indicating a higher reliance on fat-rich foods, possibly due to increased consumption of fried, processed, or spicy foods.

A significant concern is the low fibre intake (15.83 g), which is nearly half of the recommended 30 g. Inadequate fibre consumption is closely linked with gastrointestinal issues such as constipation, bloating, and poor gut health. This imbalance—characterized by low fibre and high fat intake—may contribute to the prevalence of gastrointestinal symptoms observed among the participants. Overall, the findings highlight a nutritional imbalance in the diet, emphasizing the need for targeted nutrition education focusing on improving protein and fibre intake while moderating fat consumption to promote better gastrointestinal and overall health.

### 4. Medical history of the subjects

Comorbidity assessment indicated that 43.1% of participants had existing health conditions, the most common being hypertension (33.5%), diabetes mellitus (15.3%), and gastro-esophageal reflux disease (6.1%). The majority (88.2%) did not take any medication on a regular basis. Normal bowel habits were reported by 55.5% of participants, while 27.2% experienced mixed bowel issues and 12.4% reported diarrhoea.

**5. GSRS records of the study subjects**

Gastrointestinal (GI) symptoms are highly prevalent among working women, often linked to job-related stress, long hours, and shift work, which can disturb the gut-brain axis and trigger conditions like Irritable Bowel Syndrome (IBS). Thomson et al. (2025) in their study Of 516 respondents (85% female, median age 38 years), 72.1% reported no existing GI conditions, yet 86% experienced GI symptoms in the past month (flatulence (72%), bloating (64%) and abdominal rumbling (58%)). The most concerning (causing anxiety or worry) symptoms were bloating (18%), heartburn (16%) and abdominal pain (13%). Among those without declared GI conditions, 71% attributed symptoms to foods/drinks, with 42% avoiding specific items, notably dairy (17%) and vegetables (13%). Food avoidance was more common in respondents with IBS (78%,  $P < 0.05$ ). The most common perceptions were that beans (34%) and Brussels sprouts (23%) cause flatulence, fatty and dairy foods causes bloating (17%) and carbonated soft drinks causes belching (17%). The gastrointestinal symptoms of the participants were assessed using the Gastrointestinal Symptom Rating Scale (GSRS), and the results are presented below.

Table 2  
 Distribution of Gastrointestinal Symptoms (n = 346)

S. No	GI Symptoms	No discomfort n (%)	Minor discomfort n (%)	Mild discomfort n (%)	Moderate discomfort n (%)	Severe discomfort n (%)	Moderately severe discomfort n (%)	Very severe discomfort n (%)
1	Pain/discomfort in upper abdomen	37 (10.7)	182 (52.6)	90 (26.0)	12 (3.5)	24 (6.9)	1 (0.3)	-
2	Heartburn	113 (32.7)	120 (34.7)	77 (22.3)	15 (4.3)	21 (6.0)	-	-
3	Acid reflux	42 (12.1)	124 (35.8)	149 (43.1)	28 (8.1)	2 (0.6)	1 (0.3)	-
4	Hunger pangs	37 (10.7)	137 (39.6)	77 (22.3)	48 (13.9)	45 (13.0)	2 (0.6)	-
5	Nausea	93 (26.9)	112 (32.4)	92 (26.2)	17 (4.9)	29 (8.4)	3 (0.9)	-
6	Rumbling	32 (9.2)	148 (42.8)	117 (33.8)	44 (12.7)	3 (0.9)	2 (0.6)	-
7	Bloating	40 (11.6)	207 (59.8)	59 (17.1)	35 (10.1)	4 (1.2)	1 (0.3)	-
8	Belching	95 (27.5)	121 (35.0)	77 (22.2)	21 (6.0)	29 (8.4)	3 (0.9)	-
9	Passing gas	188 (54.3)	46 (13.3)	34 (9.8)	27 (7.8)	46 (13.3)	5 (1.4)	-
10	Constipation	117 (33.8)	107 (30.9)	33 (9.5)	58 (16.8)	28 (8.1)	3 (0.9)	-
11	Diarrhoea	216 (62.4)	45 (13.0)	23 (6.6)	56 (16.2)	3 (0.9)	3 (0.9)	-
12	Loose stool	119 (34.4)	106 (30.6)	58 (16.8)	36 (10.4)	24 (6.9)	3 (0.9)	-
13	Hard stool	164 (47.4)	38 (11.0)	60 (17.3)	56 (16.2)	26 (7.5)	2 (0.6)	-
14	Urgent bowel movement	123 (35.3)	110 (31.8)	51 (14.7)	31 (9.0)	26 (7.5)	5 (1.5)	-
15	Incomplete bowel emptying	36 (10.4)	182 (52.6)	56 (16.2)	12 (3.5)	58 (16.8)	2 (0.6)	-

The distribution of gastrointestinal (GI) symptoms among the participants (n = 346) indicates that most subjects experienced no to minor discomfort across the majority of symptoms, suggesting an overall low to moderate symptom burden in the study population. Importantly, no participants reported very severe discomfort, indicating the absence of extreme gastrointestinal distress. Among upper gastrointestinal symptoms, pain/discomfort in the upper abdomen and incomplete bowel emptying showed a higher proportion of minor discomfort (52.6), while acid reflux (43.1) and rumbling (33.8) were predominantly reported under mild discomfort, reflecting the presence of functional disturbances rather than severe pathology. Heartburn (34.7) and belching (35.0) were commonly reported as minor discomfort, suggesting intermittent gastric irritation. Moderate discomfort was notably observed in symptoms related to bowel habits. Constipation (16.8), diarrhoea (16.2), and hard stool (16.2) had relatively higher proportions of participants reporting moderate discomfort, indicating variability in bowel function within the population. Additionally, hunger pangs (13.9) and rumbling (12.7) also demonstrated moderate levels, which may be associated with irregular eating patterns or gastric motility changes.

Severe discomfort, although less frequent, was evident in symptoms such as incomplete bowel emptying (16.8), hunger pangs (13.0), and passing gas (13.3), highlighting that a subset of participants experienced notable gastrointestinal distress. However, the proportion of severe symptoms remained relatively low across all categories.

Therefore, the findings suggest that gastrointestinal symptoms are predominantly mild in nature, with upper gastrointestinal symptoms (reflux and indigestion-related) being more commonly reported than lower gastrointestinal symptoms. The absence of very severe discomfort further indicates that while GI symptoms are present, they are generally not debilitating in this population. These patterns may be influenced by dietary habits, lifestyle factors, stress, and irregular meal patterns, which are common among working women.

**6. GSRS Domain Scores**

The GSRS is a disease-specific instrument of 15 items combined into five symptom clusters depicting Reflux, Abdominal pain, Indigestion, Diarrhoea and Constipation. The table below illustrates the GSRS Domain Scores. The values are expressed as mean ± standard deviation. GSRS scores are based on a 7-point Likert scale

Table-3  
 Mean GSRS Domain Scores (n = 346)

Domain	Scores
	Mean ± SD (1–7 scale)
Reflux Syndrome	3.02 ± 1.21
Abdominal Pain Syndrome	2.38 ± 1.08
Indigestion Syndrome	3.07 ± 1.25
Diarrhoea Syndrome	1.46 ± 0.82
Constipation Syndrome	1.49 ± 0.88
<b>Total GSRS Score</b>	<b>2.28 ± 0.96</b>

The domain-wise analysis of GSRS scores revealed varying levels of gastrointestinal symptom severity among the study participants. Indigestion syndrome (3.07 ± 1.25) and reflux syndrome (3.02 ± 1.21) showed the highest mean scores, indicating moderate levels of gastrointestinal discomfort in these domains. This suggests that symptoms such as bloating, belching, rumbling, heartburn, and acid reflux are relatively more prevalent among the participants. The abdominal pain syndrome (2.38 ± 1.08) demonstrated a mild to moderate level of severity, reflecting the presence of symptoms such as upper abdominal pain, hunger pangs, and nausea, though to a lesser extent compared to indigestion and reflux. In contrast, diarrhoea syndrome (1.46 ± 0.82) and constipation syndrome (1.49 ± 0.88) exhibited lower mean scores, indicating minimal to mild symptom severity in these domains. This suggests that bowel-related disturbances were less prominent compared to upper gastrointestinal symptoms in the study population. The overall mean GSRS score (2.28 ± 0.96) indicates mild gastrointestinal symptoms among the participants.

Hence, the findings indicate that upper gastrointestinal symptoms (reflux and indigestion) are more pronounced, whereas lower gastrointestinal symptoms (diarrhoea and constipation) are relatively less severe among working women. These patterns may be influenced by dietary habits, lifestyle factors, stress, and irregular meal patterns commonly observed in this group.

**7. Association between GSRS scores and frequency of spicy food intake**

Spicy foods were also reported to cause several digestive symptoms, diarrhoea, more so than any other food or drink, there were also many reports of heartburn, flatulence and abdominal pain and bloating. The presence of capsaicin in spicy foods can activate TRPV1 receptors in the GI tract causing heartburn and accelerating intestinal transit inducing abdominal pain, loosening bowel movements and increasing the rate of delivery of fermentable substrates to the colon (Gonlanchavut, 2010). The below table elucidates the Association between GSRS scale and frequent intake of spicy foods.

Table – 4  
 Association between GSRS scores and frequency of spicy food intake

Correlations				
			GSRS Scores	How often do you eat spicy food?
Spearman's rho	GSRS Scores	Correlation Coefficient	1.000	.678**
		Sig. (2-tailed)		.001
		N	346	346
	How often do you	Correlation	.678**	1.000

eat spicy food?	Coefficient		
	Sig. (2-tailed)	.001	
	N	346	346

The Spearman’s correlation analysis demonstrated a strong positive correlation between GSRS scores and the frequency of spicy food consumption ( $\rho = 0.678$ ,  $p < 0.001$ ). This indicates that higher consumption of spicy foods is strongly associated with increased gastrointestinal symptom severity among the study participants. The correlation was statistically significant, suggesting that the observed association is unlikely to be due to chance. The strength of this relationship is notably high, indicating that spicy food intake may be an important factor associated with gastrointestinal discomfort in this population.

**8. Association between GSRS scores and water intake**

Water intake is also associated with gastrointestinal function. Low water intake reduces the fecal water content and is associated with an increased prevalence of functional constipation (Murakami et al. 2007). Furthermore, differences in gut microbiota composition and metabolites have been observed between constipated patients and healthy individuals (Tian et al., 2021). The table below depicts the association between GSRS scores and daily water intake among the study participants.

Table-5  
 Association between GSRS scores and water intake

Correlations				
			GSRS Scores	Daily Water Intake
Spearman's rho	GSRS Scores	Correlation Coefficient	1.000	-.254**
		Sig. (2-tailed)		.001
		N	346	346
		Correlation	-.254**	1.000
	Daily Water Intake	Coefficient		
		Sig. (2-tailed)	.001	
		N	346	346

Spearman’s correlation analysis showed a weak to moderate negative correlation between GSRS scores and daily water intake ( $\rho = -0.254$ ,  $p < 0.001$ ), indicating that higher water consumption is associated with lower gastrointestinal symptom severity. Higher water intake was associated with reduced gastrointestinal symptoms among the study participants. The inverse association observed between water intake and GSRS scores suggests a potential protective role of adequate hydration in maintaining gastrointestinal health. Increased water intake may aid digestion, improve bowel motility, and reduce symptoms such as constipation and discomfort. However, the association is moderate and does not imply causation. It is evident that water intake influences gastrointestinal function, gut microbiota, and immunity (Sato et al., 2024). However, the specific effects of water intake on the gastrointestinal tract remain largely unexplored.

**CONCLUSION**

Gastrointestinal symptoms among working women were predominantly mild, with no cases of very severe discomfort observed. Upper gastrointestinal symptoms, particularly indigestion and reflux, were more prominent than lower gastrointestinal disturbances. A strong positive association was found between spicy food intake and GSRS scores, indicating increased symptom severity with frequent consumption. In contrast, higher water intake was associated with reduced gastrointestinal symptoms. These findings emphasize the importance of dietary modification and adequate hydration in improving gastrointestinal health among working women.

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