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Research Paper

Association Between Hypothyroidism and Constipation: A Cross-sectional Study From the PERSIAN Guilan Cohort Study

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ABSTRACT

Background: Thyroid disorders, particularly hypothyroidism, can affect the movement of the digestive system. The aim of this study was to investigate the association between hypothyroidism and constipation.

Materials & Methods: In this cross-sectional study that was conducted on the PERSIAN Guilan cohort study (PGCS), all individuals between the ages of 35 and 70 years, irrespective of gender, were included. The questionnaires were completed using dedicated online software that included demographic data, clinical characteristics, and nutritional information. Hypothyroidism was defined based on taking levothyroxine medicine as stated by the patient and diagnosis of chronic constipation was based on self-report. Individuals were divided into two groups based on their constipation status and compared with respect to the desired variables. The relationship between hypothyroidism and constipation was examined using logistic regression analysis. Odds ratio (OR) and 95% confidence interval (CI) were calculated.

Results: The prevalence of hypothyroidism and constipation were 5.1% and 4.4% respectively, and both were more common in women than in men. In unadjusted model, there was no significant association between hypothyroidism and constipation (OR=1.28, 95% CI, 0.88%, 1.875%, P=0.201). Similar result was obtained in fully adjusted model (OR=1.03, 95% CI, 0.70–1.53, P=0.875).

Conclusion: There was no significant association between hypothyroidism and constipation in this study. Since nutrition and the type of fruits and vegetables and the type of substances consumed have an effective role in eliminating constipation, we recommend that these items be considered in future studies.

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Introduction

Constipation is characterized by infrequent bowel movements, difficulty passing stools, firmness of stools, or incomplete and irregular bowel movements. It can occur idiopathically or as a secondary condition to other diseases, and is a common digestive disorder [1, 2].The Rome IV criteria are used to diagnose functional constipation [3, 4]. In Iran, the prevalence of constipation ranges from 1.4% to 37% in various studies [5]. Various factors are known to increase the risk of chronic constipation, including demographic and socio-economic factors, behavioral and lifestyle factors, as well as factors related to health status or underlying diseases [6, 7].

Among the demographic and socio-economic factors associated with constipation, we may list age, gender, income, level of education, residential status (urban or rural), and marital status, among which the most robust correlation with constipation is reported for the female gender. Regarding the relationship of other factors with constipation, various findings have been reported in different studies [6, 8]. Lifestyle factors that may potentially contribute to constipation include the level of physical activity, dietary habits (fiber and water intake), smoking, alcohol consumption, and medication use [9, 10]. Digestive diseases, endocrine disorders, neurological diseases, and medications can also be as risk factors [6, 7, 11]. Thyroid disorders, particularly hypothyroidism, can affect the movement of the digestive system [12, 13]. Studies comparing bowel movements or other bowel symptoms in euthyroid, hypothyroid, and hyperthyroid adult patients have produced varying results [14]. Physiological studies show changes in anorectal function in adult patients with hypothyroidism and hyperthyroidism, but findings regarding intestinal transit times or constipation symptoms are ambiguous [15-19].

Accoring to the literature reviewed by the authors, there are no studies on hypothyroidism status of individuals with constipation in Iran. Therefore, this study aimed to determine the relationship between constipation and hypothyroidism in the PERSIAN Guilan cohort study (PGCS).

Materials and Methods

Participants and study design

In this analytical cross-sectional study conducted in the PGCS, a subset of the PERSIAN cohort studies between the ages of 35 and 70 years, irrespective of gender, were included. The PGCS profile and PERSIAN protocol were previously published in detail [20, 21]. The process of inviting eligible families involved a two-stage approach. Firstly, a public invitation was extended to all individuals residing within the covered area, followed by a targeted visit to eligible households. Those who presented themselves at the Cohort Center of the Monastery were registered and their details were recorded in the admissions form. Subsequently, written informed consent was obtained from the referents. Exclusion criteria included inability to go to the clinic for a physical examination, mental retardation, and unwillingness to participate in the study. Individuals were divided into two groups based on their constipation status and compared with respect to the desired variables.

Study variables and data collection

Data were obtained by a questionnaire by a face-to-face interview with trained interviewers. Interviewers were proficient in the native language of the region, which facilitated communication with participants. The questionnaires were completed using dedicated online software that included demographic and clinical data: Age (year), gender (male, female), marital status (single, married, divorced, and widow), place of residence (rural, urban), education (years), employment status (employed or unemployed), wealth score index (WSI) was reported using the principal component analysis (PCA) [20]. In this study WSI categorized into three tertiles from poorest (1st tertile) to richest (3th tertile). Detailed explanation of the WSI calculation for participants were provided in previous studies from PERSIAN cohort [22, 23].

Life style data including body mass index (BMI), smoking and opium consumption (yes, no), alcohol user (yes, no), hookah (yes, no), non-steroidal anti-inflammatory drugs (NSAIDs) or antidepressants use (yes, no), Tea and coffee consumption (yes, no), fruit and vegetable consumption based on a daily intake. BMI was measured using weight in kilogram divided by height in square of meter and then categorized into normal weight, underweight, overweight, and obese for BMI levels of 18.5–24.9 kg/m^2, <18.5 kg/m^2, 25–29.9 kg/m^2 and 30 kg/m^2, respectively [24]. The measurement of physical activity was previously described in detail in previous

studies from PERSIAN cohort [22, 25]. It was measured using metabolic equivalent rates (METs) which is a self-report instrument for measuring the activities of daily living [26] of participants of PERSIAN cohort using the questionnaire. Hypothyroidism was defined based on self-report of taking levothyroxine by individuals. The diagnosis of chronic constipation was based on the patient's self-report. Constipation was defined as having fewer than three bowel movements per week based on the definition of the Mayo Clinic [27].

Statistical analysis

In this study, continuous variables were presented as Mean±SD and categorical variables as number (percentage). To determine whether those with and without constipation differ on demographic and clinical variables, χ^2 test (or Cochran–Armitage test for trend) were conducted for categorical variables, and independent t-tests were used for continuous variables. The association of constipation with hypothyroidism was examined using logistic regression analysis. Odds ratio (OR) and 95% confidence interval (CI) were calculated. OR was also adjusted for demographic and clinical variables. In total, three models were run. Model 1 was unadjusted; model 2 was adjusted for age and sex; and model 3 was adjusted for variables in Model 2 plus marital status, years of education, occupation, place of residency, wealth score index (WSI), body mass index (BMI), physical activity, smoking, hookah smoking, drug consumption, alcohol consumption, tea and coffee consumption, NSAIDs and antidepressant drugs. Data analysis was performed using SPSS software, version 16 (SPSS Inc., Chicago, IL, USA), and a P<0.05 was considered statistically significant.

Results

Characteristics of the participants

Demographic and clinical characteristics of the participants are outlined in Table 1. The mean age of the participants was 51.52±8.90 years. Of the participants, 53.5% were female, 90.6% were married, 6.1% had university education, 45.4% were unemployed, 56.2% wee resident in rural area, 32.7% had obese-BMI, 24.6% were smokers, and 13.3% consumed alcohol. Compared to participants without constipation, participants with constipation were older, more likely to be female, more widowed, more unemployed, had low WSI and low psychical activity and reported less consumption of hookah smoking and drug, more consumption of alcohol, low consumption of fruits and vegetables and more taking of NSAIDs and antidepressant drugs. The prevalence of hypothyroidism was 5.1% in the present study and was more prevalent in women than in men (8.0% vs 1.8%, P<0.001). The prevalence of hypothyroidism among participants aged 35-44 years was lower than those aged 45 or more years (P=0.025). The prevalence of constipation was 4.4% in the present study and was more common in women than in men (6.0% vs 2.7%, P<0.001). The prevalence of constipation increased with age: The highest was 6.0% in those aged 55 or more years (P for trend <0.001) (Table 2). The prevalence of constipation was higher among participants with hypothyroidism than those without hypothyroidism, although this difference was not statistically significant (5.6% vs 4.4%, P=0.200). In unadjusted model (model 1), the presence of hypothyroidism increased the odds of constipation by 1.28-fold (95% CI, 0.88%, 1.87%), although this relationship was not statistically significant (P=0.201) (Table 3). This association remained non-significant after adjusting for age and sex (OR=1.02, 95% CI, 0.70%, 1.50%). Similar result was obtained in fully adjusted model (Model 3) (OR=1.03, 95% CI, 0.70%, 1.53%) (Table 3).

Discussion

Constipation is a prevalent gastrointestinal ailment in the general population. Research comparing the frequency of bowel movements or other gastrointestinal symptoms in euthyroid, hypothyroid, and hyperthyroid adult patients has produced conflicting results. Physiological studies have demonstrated modified anorectal function in adult patients with hypothyroidism and hyperthyroidism, yet findings regarding intestinal transit times or constipation symptoms have been ambiguous. Hence, this study was carried out with the objective of ascertaining the correlation between constipation and hypothyroidism within the PGCS.

In this study, the prevalence of hypothyroidism and constipation was 5.1% and 4.4% respectively. The findings of this investigation revealed that compared to participants without constipation, participants with constipation were older, more likely to be female, more widowed, more unemployed, had low WSI and low psychical activity and reported less consumption of hookah smoking and drug, more consumption of alcohol, low consumption of fruits and vegetables and more use of NSAIDs and antidepressant drugs.

Table 1. Demographic and clinical characteristics of the participants in the PERSIAN Guilan cohort study

Demographic and Clinical Characteristics		No. (%)			P
		Total (n=10520)	With Constipation (n=468)	Without Constipation (n=10052)	
Age (y)	35-44	3139(29.8)	115(24.6)	3024(30.1)	<0.001
	45-54	3854(36.6)	143(30.6)	3711(36.9)	
	>55	3527(33.5)	210(44.9)	3317(33.0)	
	Mean±SD	51.52±8.90	53.87±9.64	51.41±8.85	<0.001
Sex	Male	4887(46.5)	130(27.8)	4757(47.3)	<0.001
	Female	5633(53.5)	338(72.2)	5295(52.7)	
Marital status	Single	305(2.9)	11(2.4)	294(2.9)	<0.001
	Married	9527(90.6)	401(85.7)	9126(90.8)	
	Widow	566(5.4)	51(10.9)	515(5.1)	
	Divorced	122(1.1)	5(1.1)	117(1.2)	
Education level	Illiterate	1738(16.5)	159(34.0)	1579(15.7)	<0.001
	1-5 classes	3312(31.5)	146(31.2)	3166(31.5)	
	6-12 classes	4832(45.9)	142(30.3)	4690(46.7)	
	University	638(6.1)	21(4.5)	617(6.1)	
	Mean±SD	6.63±4.52	4.81±4.57	6.71±4.50	<0.001
Employment	Unemployed	4781(45.4)	306(65.4)	4475(44.5)	<0.001
	Employed	5739(54.6)	162(34.6)	5577(55.5)	
Habitat	Urban	4613(43.8)	201(42.9)	4412(43.9)	0.688
	Rural	5907(56.2)	267(57.1)	5640(56.1)	
Wealth score index	Tertile 1 (M)	3507(33.3)	178(38.0)	3329(33.1)	0.005
	Tertile 2 (medium)	3506(33.3)	160(34.2)	3346(33.3)	
	Tertile 3 (high)	3507(33.3)	130(27.8)	3377(33.6)	
BMI (kg/m^2)	Underweight	141(1.3)	13(2.8)	128(1.3)	0.011
	Normal	2746(26.1)	147(31.4)	2599(25.9)	
	Overweight	4198(39.9)	160(34.2)	4037(40.2)	
	Obese	3435(32.7)	148(31.6)	3288(32.7)	
	Mean±SD	28.14±5.09	27.80±5.58	28.16±5.06	0.135
Physical activity (MET)	Tertile 1 (low)	3507(33.3)	226(48.3)	3281(32.6)	<0.001
	Tertile 2 (medium)	3506(33.3)	149(31.8)	3357(33.4)	
	Tertile 3 (high)	3507(33.3)	93(19.9)	3414(34.0)	
	Mean±SD	41.26±8.88	38.20±7.57	41.40±8.92	<0.001

Demographic and Clinical Characteristics		No. (%)			P
		Total (n=10520)	With Constipation (n=468)	Without Constipation (n=10052)	
Smoking		2584(24.6)	98(20.9)	2486(24.7)	0.063
Hookah smoking		1515(14.4)	45(9.6)	1470(14.6)	0.003
Opium consumption		726(6.9)	11(2.4)	715(7.1)	<0.001
Alcohol consumption		1395(13.3)	101(21.6)	1294(12.9)	<0.001
Tea consumption		7663(72.8)	316(67.5)	7347(73.1)	0.008
Coffee consumption		4578(43.6)	189(40.4)	4398(43.8)	0.151
Vegetables (times in a day)	<3	949(9.0)	63(13.5)	886(8.8)	<0.001
	3-5	2935(27.9)	160(34.2)	2775(27.6)	
	>5	6636(63.1)	245(52.4)	6391(63.6)	
Fruits (times in a day)	<2	1577(15.0)	119(25.4)	1458(14.5)	<0.001
	2-4	3698(35.2)	160(34.2)	3538(35.2)	
	>4	5245(49.9)	189(40.4)	5056(50.3)	
NSAIDs		1505(14.3)	119(25.4)	1386(13.8)	<0.001
Antidepressants		678(6.4)	75(16.0)	603(6.0)	<0.001

Abbreviations: SD: Standard deviation; BMI: Body mass index; NSAIDs: Non-steroidal anti-inflammatory drugs; MET: Metabolic equivalent rate.

Table 2. Prevalence of hypothyroidism and constipation according to the age and sex of the participants

Demographic Variables		No. (%)	
		Hypothyroidism	Constipation
Age (y)	35-44	135(4.3)	115(3.7)
	45-54	221(5.7)	143(3.7)
	≥55	184(5.2)	210(6.0)
	P†	0.025	<0.001
	P for trend‡	0.106	<0.001
Sex	Male	89(1.8)	130(2.7)
	Female	451(8.0)	338(6.0)
	P†	<0.001	<0.001
Total		540(5.1)	468(4.4)

†Chi–square test, ‡Cochran–Armitage test for trend.

Table 3. Relationship between hypothyroidism and constipation among the participants

Hypothyroidism	No. (%)	Model 1 (Unadjusted)		Model 2		Model 3	
	Prevalence of Constipation	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
No	438(4.4)	1		1		1	
Yes	30(5.6)	1.28 (0.88-1.87)	0.201	1.02 (0.70-1.50)	0.909	1.03 (0.70-1.53)	0.893

OR: Odds ratio, CI: Confidence interval.

Note: Model 1: Unadjusted model, Model 2: Adjusted for age and sex, Model 3: Adjusted for model 2 plus marital status, years of education, occupation, place of residency, wealth score index, BMI, physical activity, smoking, hookah smoking, alcohol consumption, tea and coffee consumption, fruits and vegetables consumption, NSAIDs and antidepressant drugs.

Regarding demographic and socio-economic factors linked to constipation, female gender has been reported to have the strongest correlation with constipation. Other studies have produced varying results regarding the relationship between constipation and these factors [6, 8]. The findings of this study are in line with those of previous research.

Based on the findings of this research, the incidence of constipation was more prevalent among individuals with hypothyroidism as compared to those without it, although this variance did not achieve statistical significance. In accordance with our investigation, Samei et al.'s research, through scrutinizing the incidence of hypothyroidism in children with persistent constipation, evinced that there is a correlation between hypothyroidism and constipation in minors [28]. Additionally, Deen et al.'s study demonstrated that 33% of hypothyroidism patients underwent symptoms of bowel dysfunction [29], which is in harmony with the findings of our investigation.

Kim et al.'s investigation evinced a 0.41% and 1.76% incidence of overt and subclinical hypothyroidism, respectively. The study demonstrated a negligible prevalence of overt and subclinical hypothyroidism in constipated patients. Thyroid function did not impinge upon colon transit time [30]. This contrasts with our research, which may be attributed to differences in the statistical population of the two studies.

In accordance with our findings, Yaylali et al.'s study aimed to scrutinize whether hypothyroidism results in gastrointestinal motor dysfunction. The investigation demonstrated that the average transit time of the esophagus and gastric emptying time in the hypothyroid group had increased by 30±4 minutes compared to the control group [31]. The study indicated that hypothyroidism significantly diminishes the motor activity of the esophagus and stomach, causing disruption in digestive function, sluggish movement, and ultimately leading to constipation. A constraint of this investigation was that the identification of hypothyroidism and constipation was reliant on self-reporting. While interviewer-patient relationships are typically intimate in cohort studies, conducting research based on TSH levels or Rome 4 criteria for constipation could provide a more precise assessment of this correlation. The limitation of this study is that the definition of hypothyroidism was based on taking drugs and the real hypothyroidism status was not detected based on TSH, T3, and T4 tests. Also, constipation was based on self-report.

Conclusion

The fundamental etiology of constipation in hypothyroidism arises from diminished gastrointestinal motility. Ordinarily, the colon's musculature contracts to propel fecal matter through the intestines and into the rectum. However, in hypothyroidism, the muscles exhibit insufficient frequency and strength of contraction, resulting in sluggish stool transit through the colon. There was no significant statistical association between hypothyroidism and constipation in this study. Since nutrition and the type of fruits and vegetables and the type of substances consumed have an effective role in eliminating constipation, we recommend that these items be considered in future studies.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethical Committee of the Guilan University of Medical Sciences (Code: IR.GUMS.REC.1402.150), and all participants gave informed consent prior to their inclusion in the study.

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Authors' contributions

Conceptualization and supervision: Fariborz Mansour-Ghanaei and Farahnaz Joukar; Methodology: Mohammadreza Naghipour; Data collection: Fariborz Mansour-Ghanaei, Farahnaz Joukar and Soheil Hassanipour; Data analysis: Saman Maroufizade; Investigation and writing the original draft: Reyhaneh Ghanbari and Sara Yeganeh; Review & editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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