



OVERVIEW OF NUTRITIONAL STATUS AND SYMPTOMS OF DIABETIC GASTROPARESIS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS WITH UNCONTROLLED BLOOD GLUCOSE LEVELS

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ABSTRACT

Gastroparesis is a complication experienced by 20% - 50% of chronic diabetes mellitus patients with poor glycemic control. Hyperglycemia will slow down gastric emptying thereby reducing oral intake and mismatch of nutrient absorption which causes impaired nutritional status. Objective: to determine the nutritional status and symptoms of diabetic gastroparesis in type 2 diabetes mellitus patients with uncontrolled blood glucose levels. Method: Quantitative descriptive study on type 2 DM patients at RSAU Dr. M. Salamun. The sampling technique uses consecutive sampling with a sample size of 82 subjects. Data were obtained through gastrointestinal symptom score (GSS) questionnaires, height and weight checks, and patient medical records. Furthermore, the data results will be processed using univariate analysis. The questionnaire is considered reliable with the results of the reliability test of the cronbach alpha value >0.50. Result: 71.9% of respondents experienced symptoms of diabetic gastroparesis with normal nutritional status (37.1%) and obesity (37.1%). The majority were female, ≥60 years old, and 1-5 years of DM. Conclusion: Health education and intervention in modifying lifestyle better so that it can control blood glycemia and make a diet that is suitable for patients with gastroparesis so that it can minimise the symptoms of gastroparesis experienced.

Keywords: diabetes mellitus; gastroparesis; nutritional status

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INTRODUCTION

Gastroparesis is one of the microvascular complications of neuropathy in chronic diabetes mellitus characterised by delayed gastric emptying in the absence of mechanical obstruction (Jalleh et al., 2019). The process of gastroparesis involves gastrointestinal (GI) vagal dysfunction due to extreme hypoglycaemia or hyperglycaemia (Lee et al., 2024). The most common symptoms in diabetic patients with upper gastrointestinal symptoms include nausea (80.6%), vomiting (53.7%), abdominal pain (52.8%) and 47% of patients have abnormal gastric emptying (Camilleri & Sanders, 2022; Jalleh et al., 2019). However, patients with associated symptoms may exhibit normal or rapid gastric emptying, making GI manifestations and gastric emptying time ambiguous (Lee et al., 2024).

Glucose metabolism is closely related to the gut and pancreas. This applies to the process of gastric emptying with hyperglycaemia inhibiting the emptying process by decreasing antral motility in patients with diabetes mellitus. In addition, impaired gastric emptying can affect glycaemic control to the extent that fluctuations are likely to occur. This makes glycaemic control and gastric emptying have a bidirectional relationship (Bharucha et al., 2019).

Pramesti (2023) proved the association between gastroparesis and hyperglycaemia in 47 patients (66.2%), but there is no known association with nutritional status in patients with diabetes mellitus.

Diabetic gastroparesis (DGp) is a potential complication in patients with poor control. Hyperglycaemia is associated with uncontrolled diabetes and diabetic gastroparesis (Aswath et al., 2023). In addition, another risk factor is obesity in chronic diabetes patients (Kurniawan & Hanjaya Suwandi, 2019). Diabetic patients with more nutritional status have higher glucose levels and occurred in 52,1% of patients (Imansary et al., 2021). However, meta-analysis study conducted by Aljaras et al (2022) found 194 (41.8%) of 464 gastroparesis patients had an average normal BMI. In addition, research by Amjad et al (2022) found that gastroparesis patients experienced no clinical improvement more in patients with lower-than-normal BMI, so low BMI is a factor associated with poor glycaemic control. Patients with low BMI are more likely to experience more severe symptoms of gastroparesis resulting in malnutrition and have worse clinical outcomes. Patients with diabetic gastroparesis may experience impaired nutritional status, poor glycaemic control, and worsening of symptoms. (Kurniawan & Hanjaya Suwandi, 2019). These impacts will affect the patient care process such as increased hospitalisation and associated economic consequences (Ye et al., 2022) which can lead to significant psychological distress and worsening quality of life (Syed et al., 2020).

The difference in the results of studies related to nutritional status in DM patients and gastroparesis patients proves that there is a discrepancy between theory and research results so that further research needs to be done to find out the truth of theoretical understanding. In addition, research related to gastroparesis is still very rarely studied in Indonesia and has never been studied in West Java, especially related to nutritional status. Air Force Hospital (RSAU) dr. M. Salamun is a level II or type B military hospital located in Bandung Regency, West Java. Based on preliminary studies conducted by researchers on 24 February 2024, it was found that there were 102 patients with diabetes mellitus who were outpatients in January 2024. Based on this explanation, the researcher aim to conduct research related to the description of nutritional status and symptoms of diabetic gastroparesis in type 2 diabetes mellitus patients with uncontrolled blood glucose levels at Dr. M. Salamun Air Force Hospital.

METHOD

This study uses a descriptive research design using a quantitative approach to identify nutritional status and symptoms of diabetic gastroparesis in type 2 diabetes mellitus patients with uncontrolled glucose levels. This study uses two variables, namely nutritional status and symptoms of gastroparesis. this research was conducted at RSAU Dr. M. Salamun which is located in cidadap district, bandung city, west Java. The population in this study were 102 patients with diabetes mellitus who were outpatients based on patient data in January 2024 with inclusion criteria 1) are patients with type 2 diabetes mellitus with a diagnosis of at least one year ago, 2) have two records of checking blood glucose levels within 6 months. sampling using non-probability sampling techniques, namely consecutive sampling with a sample size using the slovin formula, which is a minimum of 82 subjects. The operational definition contains nutritional status variables by measuring body weight (Kg) and height (m) and then will be calculated using the BMI formula: $BB(Kg)/TB(m)^2$ to get the patient's body mass index. Furthermore, the variable of blood glucose level is based on the last two blood glycaemic tests, namely FGP ≥ 100 mg/dL, PPG ≥ 140 mg/dL, or RPGT ≥ 200 mg/dL. Then, the diabetic gastroparesis variable to determine the symptoms of gastric emptying disorders using the Gastrointestinal Symptom Score (GSS) questionnaire which contains 10 question points

related to diabetic gastroparesis symptoms with 5 Likert scale answer options (0-4). This questionnaire is considered valid with a correlation coefficient of 0.887 and 0.864 and a significant Spearman rank correlation coefficient ($P < 0.0001$) (Adam et al, 2005). The score results show that patients do not experience symptoms if they get a score of 0 and experience symptoms if they get a score of 1-40 where the greater the score obtained, the more severe the symptoms experienced, so the researchers categorised the severity of symptoms into 4 categories, namely mild (1-10), moderate (11-20), severe (21-30), and very severe (31-40). Then, the data was analysed univariately to determine the frequency distribution of variable characteristics.

RESULTS

Table 1.
Respondent Characteristics (n=89)

Characteristics	f	%
Sex		
Male	32	36,0
Women	57	57,0
Age		
19-44 years old	4	4,5
45-59 years old	40	44,9
≥60 years	45	50,6
Duration of Diabetes mellitus		
1-5 years	57	64,0
6-10 years	17	19,1
11-15 years	7	7,9
≥16 years	8	9,0
Nutrition Status/BMI	0	0
Very Thin	0	0
Skinny	33	37,0
Normal	21	23,6
Fat	35	39,3
Obesity		
Consumption of Medicines		
Consuming	2	2,2
not consuming	87	97,8
Alcohol Consumption		
Consuming	0	0
Not consuming	89	100
Gastric Surgery Experience		
Have experience	0	0
No experience	89	100
Comorbid Diseases		
Have/had	4	4,5
Not having	85	95,5

Based on table 1, it is known that the characteristics of the most respondents in this study are female patients (64%), aged more than 60 years (50.6%), have suffered from diabetes mellitus for 1-5 years (64%), have obese (39.3%) and normal (37.1%) nutritional status. The majority of respondents did not take drugs that could affect the work of the digestive system (97.8%). Based on the data obtained, none of the respondents consumed alcohol in the last two weeks (100%) and none of the respondents had gastric surgery experience in the last one month (100%). Most respondents did not have any comorbid diseases of particular concern (95.5%)

Table 2.
Diabetic Gastroparesis (n=89)

Characteristics	f	%
Diabetic gastroparesis		
Have diabetic gastroparesis	64	71,9
Do not have diabetic gastroparesis	25	28,1
Severity of symptoms		
Asymptomatic	25	28,1
Mild	45	50,6
Moderate	15	16,9
Severe	3	3,4
Very Severe	1	1,1

Based on table 2, it is known that there are 64 respondents (71.9%) who experience symptoms of diabetic gastroparesis while 25 other respondents (28.1%) do not have symptoms of diabetic gastroparesis. then, the majority of respondents experienced mild symptoms of diabetic gastroparesis 45 (50.6%).

Table 3.
Symptoms of Diabetic Gastroparesis (n=89)

Symptoms	Having Symptoms		No Symptoms	
	f	%	f	%
Nausea	31	34,8	58	65,2
Vomiting	9	10,1	80	89,9
Bloating/excessive belching	31	34,8	58	65,2
Stomach cramps	12	28,1	77	28,1
Early satiety	33	37,1	56	62,9
Acid reflux/heartburn	20	22,5	69	77,5
Morning discomfort	24	27,0	65	73,0
Decreased appetite	33	37,1	56	62,9
Discomfort back of chest (retrosternal)	26	29,2	63	70,8
Epigastric pain	34	38,2	55	61,8

Table 3 shows the symptoms felt by respondents based on the points on the questionnaire. It can be seen that the most common symptom experienced by respondents was epigastric pain, which is pain in the upper abdomen such as stabbing 34 (38.2%), early satiety 33 (37.1%), and decreased appetite 33 (37.1%). The next symptoms were nausea in 31 respondents (34.8%), and bloating/excessive belching in 31 (34.8%). In addition, the least symptoms felt by respondents were vomiting 9 (10.1%) and abdominal cramps 12 (28.1%). These symptoms were seen based on 89 respondents (100%) without looking at the severity of the symptoms experienced.

Table 4.
Diabetic Gastroparesis Based on Respondents' Characteristics (n=89)

Characteristics	Symptoms of Diabetic Gastroparesis					
	Having Symptoms		No Symptoms		Total	
	f	%	f	%	f	%
Sex						
Male	18	20,2	14	15,7	32	36,0
Women	46	51,7	11	12,4	57	64,0
Total	64	71,9	25	28,1	89	100
Age						
19-44 years old	1	1,1	3	3,4	4	4,5
45-59 years old	29	32,6	11	12,4	40	44,9
≥60 years	34	38,2	11	12,4	45	50,6
Total	64	71,9	25	28,1	89	100
Duration of Diabetes mellitus						

1-5 years	39	43,8	18	20,2	57	64
6-10 years	14	15,7	3	3,4	17	19,1
11-15 years	4	4,5	3	3,4	7	7,9
≥16 years	7	7,9	1	1,1	8	9,0
Total	64	71,9	25	28,1	89	100
Nutrition Status/BMI						
Normal	25	28,1	8	9	33	37,1
Fat	14	15,7	7	7,9	21	23,6
Obesity	25	28,1	10	11,2	35	39,3
Total	64	71,9	25	28,1	89	100
Consumption of Medicines						
Taking	2	2,2	0	0	2	2,2
Not consuming	62	69,7	25	28,1	87	97,8
Total	64	71,9	25	28,1	89	100
Comorbid Diseases						
Have/had	3	3,4	1	1,1	4	4,5
Not having	61	68,5	24	27	85	95,5
Total	64	71,9	25	28,1	89	100

The distribution of gastroparesis symptoms based on the patient's condition can be seen in Table 4 with 64 out of 89 patients (71.9%) having diabetic gastroparesis symptoms. Most of the respondents who had symptoms of gastroparesis were female patients (51.7%), aged ≥60 years 34 (38.2%), and had suffered from DM for 1-5 years 39 (43.8%). Symptoms of diabetic gastroparesis were more prevalent among respondents with normal nutritional status 25 (28.1%) and obesity 25 (28.1%). There were 2 respondents (2.2%) taking medication who also experienced symptoms of gastroparesis. Furthermore, 3 out of 4 respondents (3.4%) with complicating diseases experienced symptoms of gastroparesis.

Table 5.
Severity of Diabetic Gastroparesis Based on Respondents' Characteristics (n=64)

Characteristics	Severity of Symptoms of Diabetic Gastroparesis									
	Mild (1-10)		Moderate (11-20)		Severe (21-30)		Very severe (31-40)		Total	
	f	%	f	%	f	%	f	%	f	%
Sex										
Male	14	21,9	3	4,7	1	1,6	0	0	18	28,1
Women	31	48,4	12	18,8	2	3,1	1	1,6	46	71,9
Total	45	70,3	15	23,4	3	4,7	1	1,6	64	100
Age										
19-44 years old	0	0,0	0	0,0	1	1,6	0	0,0	1	1,6
45-59 years old	19	29,7	8	12,5	1	1,6	1	1,6	29	45,3
≥60 years	26	40,6	7	10,9	1	1,6	0	0,0	34	53,1
Total	45	70,3	15	23,4	3	4,7	1	1,6	64	100
Duration of Diabetes mellitus										
1-5 years	29	45,3	7	10,9	2	3,1	1	1,6	39	60,9
6-10 years	10	15,6	3	4,7	1	1,6	0	0,0	14	21,9
11-15 years	2	3,1	2	3,1	0	0,0	0	0,0	4	6,3
≥16 years	4	6,3	3	4,7	0	0,0	0	0,0	7	10,9
Total	45	70,3	15	23,4	3	4,7	1	1,6	64	100
Nutrition Status/BMI										
Normal	19	29,7	6	9,4	0	0,0	0	0,0	25	39,1
Fat	10	15,6	2	3,1	1	1,6	1	1,6	14	21,9
Obesity	16	25,0	7	10,9	2	3,1	0	0,0	25	39,1
Total	45	70,3	15	23,4	3	4,7	1	1,6	64	100

Consumption of Medicines										
Taking	0	0,0	2	3,1	0	0,0	0	0,0	2	3,1
Not consuming	45	70,3	13	20,3	3	4,7	1	1,6	62	96,9
Total	45	70,3	15	23,4	3	4,7	1	1,6	64	100
Comorbid Diseases										
Have/had	3	4,7	0	0,0	0	0,0	0	0,0	3	4,7
Not having	42	65,6	15	23,4	3	4,9	1	1,6	61	95,3
Total	45	70,3	15	23,4	3	4,9	1	1,6	64	100

Table 5 describes the severity of diabetic gastroparesis symptoms in respondents with gastroparesis symptoms with the majority experiencing mild symptoms in 45 out of 64 respondents (70.3%). When viewed from the characteristics, it can be seen that the female is 31 (48.4%), aged ≥ 60 years (40.6%), has suffered from DM for 1-5 years (45.3%), and has normal nutritional status (29.7%). Furthermore, 2 respondents with medication use had moderate symptoms (3.1%) and 3 respondents with complicating diseases (4.7%) experienced mild symptoms.

DISCUSSION

Characteristics of respondents

The majority of people with type 2 diabetes mellitus are female and aged ≥ 60 years. This is in accordance with the book Fandinata & Ernawati (2020) Based on Sex, women have a higher prevalence of diabetes mellitus because it is influenced by hormones, metabolic systems, and genetic factors, besides that, menopause can also result in decreased insulin production. Meanwhile, by age, the older a person is, the aging process will reduce the ability of beta cells to produce insulin. This result is in line with the research of Arania et al (2021) that the prevalence of DM is more prevalent in older adults and women. Research Asghar et al (2023) also found that 63.8% of DM patients were women with an average age of 54.3 ± 0.8 . In addition, based on table 1, it can be seen that none of the respondents used alcohol and had a history of gastric surgery so that researchers could minimise the bias that might occur in patients who experience symptoms of diabetic gastroparesis.

The results showed that there were 2 respondents who took drugs that could interfere with the digestive process of analgesics. Kim & Kuo (2019) said that the use of analgesic drugs can trigger the appearance of gastroparesis symptoms so that there can be bias in the cause of the symptoms. In addition, there were 12 respondents (13.48%) who had a history of using lansoprazole, a PPI (proton pump inhibitor) class drug, with 11 of them having symptoms of gastroparesis. based on theory Kim & Kuo (2019); Farmer et al (2019); Adam et al (2005), the use of these drugs is not part of the drugs that need to be considered because they have different functions and effects on the digestive system. However, the effect of using this drug needs to be studied further to ascertain whether there is a bias in the symptoms of gastroparesis in DM patients who take it.

In addition, there were 21 other respondents (23.89%) who took more than five types of drugs in the last two weeks but were not related to digestion or the types of drugs that needed attention. The use of these drugs is feared to be the cause of the symptoms of gastroparesis experienced, especially the symptoms of nausea. 3 out of 21 respondents said that the symptoms of nausea they experienced were likely due to taking many types of drugs in close proximity. This is because these patients also have complications such as heart problems and stroke.

Nutritional Status and Diabetic Gastroparesis in Diabetes Mellitus Patients

39.3% of DM respondents have obese nutritional status. This can occur because the work of

insulin decreases due to an increase in body fat levels, making glucose in the blood accumulate and not channeled into cells, resulting in an increase in glucose. (Arania et al., 2021). Diabetic patients with more nutritional status have higher glucose levels (Imansary et al., 2021). These results are reinforced by Wulandari & Adelina (2020). 40% of type 2 DM patients have a nutritional status of fat and obesity, then research by Mukhyarjon et al (2021) 79% of patients with type 2 DM have obese nutritional status.

Symptoms of diabetic gastroparesis were experienced by 71.9% of respondents with the majority experiencing mild symptoms and having obese and normal nutritional status with 28.1% each. The level of symptoms experienced indicates the manifestation of disease severity (Adam et al, 2005). In addition, the results in the study occurred because metabolic control is influenced by glycemic so that if the patient has poor glycemic control, it can slow down the process of gastric emptying. Furthermore, the body experiences a mismatch in nutrient absorption and insulin release, triggering DGp (Aswath et al., 2023; Bharucha et al., 2019). Chronic diabetic patients with obesity are more likely to experience gastroparesis (Kurniawan & Hanjaya Suwandi, 2019). These results are in line with the research of Alanazi et al (2022) found that patients with gastroparesis were obese (12.2%). Similar results were obtained in the study of Hagopian et al (2022) that patients with gastroparesis occurred in obese and obese BMI. Research Lee et al (2024) also found delayed stomach emptying time occurred more in patients with normal BMI 24.9 ± 3.4 . similar results were obtained by Aljaras et al (2022) meta-analysis which found that the average BMI of patients with gastroparesis was normal (41.8%).

When viewed based on the points on the questionnaire, it can be seen that the symptoms most experienced by respondents are epigastric pain, early satiety, and decreased appetite. These symptoms are interrelated due to pylorus dysfunction due to missing ICC which makes food movement delayed (Farmer et al, 2019). This is in accordance with research by Asghar et al (2023) found that the most common symptom was early satiety (45.1%) and Barrett et al (2023) found that 25.21% of patients experienced delayed stomach emptying. Symptoms may result in decreased oral intake and malnutrition. However, research by Sullivan et al (2020) suggests that the symptoms experienced do not necessarily correlate with the severity of delayed gastric emptying.

Some other results found in the study were that the majority of respondents with DGp symptoms were female. This result is consistent with the study by Lee et al (2024) that 56.3% patients were female. The factors for this high incidence are not clearly known but hormonal fluctuations related to the hormonal cycle and the link between estrogen regulation of neuronal nitric oxide synthesis and gastric motility may be an influential factor. 2 respondents who took analgesic drugs and 3 out of 4 respondents with comorbid diseases experienced symptoms of gastroparesis, this may cause the pathological symptoms experienced to overlap (Uppaluri et al., 2024). 43.8% of respondents with gastroparesis symptoms were DM patients who had been diagnosed for 1-5 years. This result shows a difference with the research of Kostitska et al (2019) which states that the risk of diabetic gastroparesis complications can occur in patients with chronic type 2 diabetes mellitus who have been diagnosed for more than 10 years.

CONCLUSION

Patients with diabetes mellitus in the internal medicine clinic of RSAU Dr M. Salamun were predominantly female, aged ≥ 60 years, had diabetes 1-5 years, and had an obese nutritional

status. Patients with mild gastroparesis symptoms were more common in women, aged ≥ 60 years, had normal and obese nutritional status, and suffered from diabetes 1-5 years.

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