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Research Article

**PREVALENCE AND DETERMINANTS OF DELAYED
GASTRIC EMPTYING IN TYPE 2 DIABETIC PATIENTS.**¹Dr Iqra Soofi, ²Dr Ikram Muhammad Zaman Naseem, ³Dr Hafiz Samiullah¹MBBS, University Medical and Dental College, Faisalabad.²MBBS, Fatima Memorial Medical College, Lahore.³MBBS, Sahiwal Medical College, Sahiwal.

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Abstract:

Major cause of morbidity in diabetic patients is relatively due to disturbances in upper gastrointestinal motility and had negative influence on quality of life. In long standing type 1 diabetes, approximately 30-60% patients had reported delayed gastric emptying which is most important gastrointestinal complication. Gastric emptying is usually more rapid in type 1 patients as compared to normal during euglycemia. There is limited literature available about the prevalence of gastroparesis in type 2 diabetes. There is no adequate information available about the prevalence of delayed gastric emptying in older patients in type 2 which is relatively different from type 1 patients. The rate of gastric emptying is regulated by acute changes in blood glucose concentration as during hyperglycemia there is slow gastric emptying and increased while hypoglycemia and autonomic nerve function in type 1 patients. This modulation is different in both type 1 diabetes and type 2. There is weak association between gastroparesis and autonomic dysfunction. Hence it is not surprising that the rise in blood glucose after the meal was greater in those with faster gastric emptying in those patients treated with insulin. Whereas there is no clear explanation of no difference found in patients with oral hypoglycemic. Previous literature has stated that association of diabetes has direct consequences on impaired gastric emptying but the association of upper gastrointestinal symptoms and the rate of gastric emptying is weak. However, patients might have no symptoms at all with gastroparesis. The current study confirms the weak association between gastric emptying in type 1 diabetic patients and gastrointestinal symptoms and have positive association with type 2 diabetic patients. Autonomic nerve dysfunction was also assessed which does not have any influence on gastric emptying rate.

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INTRODUCTION:

Major cause of morbidity in diabetic patients is relatively due to disturbances in upper gastrointestinal motility and had negative influence on quality of life. In long standing type 1 diabetes, approximately 30-60% patients had reported delayed gastric emptying which is most important gastrointestinal complication. Gastric emptying is usually more rapid in type 1 patients as compared to normal during euglycemia. There is limited literature available about the prevalence of gastroparesis in type 2 diabetes. There is no adequate information available about the prevalence of delayed gastric emptying in older patients in type 2 which is relatively different from type 1 patients. The rate of gastric emptying is regulated by acute changes in blood glucose concentration as during hyperglycemia there is slow gastric emptying and increased while hypoglycemia and autonomic nerve function in type 1 patients. This modulation is different in both type 1 diabetes and type 2. There is weak association between gastroparesis and autonomic dysfunction. The duration of diabetes depends upon the prevalence of gastroparesis and it could be higher in females than males. In type 1 patients the relation of upper gastrointestinal symptoms is poor with the rate of gastric emptying. The aim of the study is to assess the prevalence of gastric emptying in type 2 diabetes and the relationship of upper gastrointestinal symptoms with gastric emptying.

MATERIALS AND METHODS:

It was a cross-sectional study and recruited 150 participants with type 2 diabetes who met the inclusion criteria. The considered mean age 60.2 ± 9.0 years with the duration of diabetes 10.1 ± 8.2 years. 120 patients were having BMI more than 25 and were treated with oral hypoglycemic therapy only and remaining 30 were on insulin. No participants were on combination of both oral drugs and insulin. Any previous gastrointestinal disease, symptomatic hepatic renal or pancreatic disease and use of any medication which lowers down the gastrointestinal motility were excluded from the study. After admitting to hospital detailed assessment was performed within one week. Assessments of upper gastrointestinal symptoms, gastric emptying, glycemic control and autonomic nerve function was done. The test meal was performed before 30 min of oral hypoglycemic medication or usual insulin dose to the participants after keeping them overnight fast. The capillary blood samples were taken for the measurement of blood glucose immediately before the meal and with regular interval

at 30, 60 and 120 min. from the blood samples the glycated hemoglobin was also measured. An assessment questionnaire related to gastrointestinal symptoms were filled by the participants. Autonomic nerve function was assessed after the completion of gastric emptying measurement using power spectral analysis of heart rate variability. A questionnaire which was developed by Horowitz et al was used to assess the upper gastrointestinal symptoms such as anorexia, nausea, early satiety, vomiting, abdominal pain, bloating and hurt burn and were graded as none to mild, moderate and severe by giving numbers from 0 to 3. Sum of number and severity of symptoms was calculated as global symptom score. A written informed consent was taken from all the participants after explaining them the purpose of the study. <0.05 was considered as significant P value. For data analysis Mann-Whitney test, ANOVA and spearman correlation was used.

RESULTS:

The mean glycated hemoglobin was $8.1\% \pm 2.9\%$. the abnormal nerve function was seen in 102 of 150 participants. 72 patients were presented with upper gastrointestinal symptoms and those symptoms were seen more frequently in women. Diabetic retinopathy was seen in 25 participants. The most common symptom of upper gastrointestinal disease was bloating, observed in 35 patients then early satiety was seen in 15 participants, nausea and anorexia reported by 10 participants, 5 patients complained about heart burn and 3 participants marked vomiting. The median symptom score was 0 (0-9) in the whole group, 2.0 (1-9) in subjects with normal emptying and 3.0 (1-5) in the subgroup with delayed gastric emptying. The mean T50 was 64.7 ± 70.4 min, and lag phase 9.6 ± 7.9 min, these were related ($P < 0.01$). Gastric emptying was delayed, as assessed by the T50, in 26 subjects (17.7%) and in the whole group was significantly prolonged comparing to the control group. There was no difference seen between insulin and oral drug treated participants. The rate of gastric emptying was lower in females as compared to males. There was no significant association of gastric emptying with autonomic nerve function, retinopathy and upper gastrointestinal symptoms. Participants who had early satiety and nausea reported slower gastric emptying. Analysis done by simple regression method has shown weak relation between gastric emptying and glycated hemoglobin. However, there was a remarkable association between lag phase and blood glucose levels during the gastric emptying measurements. A positive association between the gastric emptying rate and glycated hemoglobin was seen in the group of oral hypoglycemic drugs. The relation of gastric emptying

with age, duration of diabetes and body mass index was weak. In diabetes and in control group there was no significant difference between obese and non-obese participants with gastric emptying. There was a rise of glycemia was evident between 30-60 min in the insulin treated group. Meanwhile there was no difference in the group treated by oral hypoglycemic drugs.

DISCUSSION:

The study has shown that gastric emptying in participants without diabetes was not seen frequently. Females were more prevalent and the presence of nausea and early satiety are more prone with probability of delayed gastric emptying. Studies has shown that participants with longstanding type 2 diabetes have delayed gastric emptying more frequently. The prevalence of delayed gastric emptying was relatively low and less than we anticipated. The results of current study are difficult to co relate with other studies due to substantial differences in patient groups and different methods used. Limited information has available on the effect of delayed gastric emptying comorbidities. Some of the statistics has shown the relation between the rate of gastric emptying and heart, lung, liver diseases or Parkinson's disease, occurring frequently in older age. Above 80% participants were treated with oral glyceemic drug. There must be complete information about the effect of commonly used medications such as beta blockers and calcium channel blockers on delayed gastric emptying. Some of the studies have elaborated only verapamil and nitrates. A study conducted by Bertin has described the accelerated gastric emptying in obese patients without diabetes. Similarly, in current study, we could not find out any correlation of gastric emptying in participants with higher BMI. No association was found between the rate of gastric emptying and the duration of diabetes in patients with type 1 or type 2 diabetes. Whereas with the duration of diabetes there is increase in complication which is linked with poor glyceemic control. Previously it was considered that the main causing factor of gastroparesis is autonomic neuropathy while study has shown a very weak relation between gastric emptying and cardiovascular autonomic function. A study has stated that females have more frequently reported gastroparesis which is linked with increased rate of diabetes and also the cause of delayed gastric emptying in functional dyspepsia. An important determinant of gastric emptying is acute glyceemia. But the current study has failed to assess the relationship between them. The responses of oral carbohydrate is less in type 2 patients

with glyceemic and insulinemic when there is decreased gastric emptying.

Hence it is not surprising that the rise in blood glucose after the meal was greater in those with faster gastric emptying in those patients treated with insulin. Whereas there is no clear explanation of no difference found in patients with oral hypoglycemic. Previous literature has stated that association of diabetes has direct consequences on impaired gastric emptying but the association of upper gastrointestinal symptoms and the rate of gastric emptying is weak. However, patients might have no symptoms at all with gastroparesis. The current study confirms the weak association between gastric emptying in type 1 diabetic patients and gastrointestinal symptoms and have positive association with type 2 diabetic patients. Autonomic nerve dysfunction was also assessed which does not have any influence on gastric emptying rate.

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