



Can rely on guessing blood glucose values in the management of an emergency tooth extraction in diabetic patients. Cross-sectional study in Derna city, Libya

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Abstract:

Aim: The aim of our study was designed to examine how accurate patients with diabetes are at guessing their own blood glucose levels in the context of a routine visit to their normal diabetic clinic. **Material and Methods:** This is a cross-sectional study conducted at Laboratory of Genetic Engineering Department in College of Medical Technology and Diabetes and Heart Center laboratories in Derna City, Libya over a period of one month from (february 2017 to March 2017). SPSS software was used for data analysis and the appropriate statistical tests were applied at (p value set at 0.05). **Results:** A total of 104 patients, 57(54.8%) males and 47(45.2%) females were participated in our study with over all mean of age 56.5 ± 9.98 years and over all mean of diabetes duration 12 ± 7.04 years. Additionally, when the real blood glucose result was compared to a guessing patient's result using the criterion of (15mg/dl), it was discovered that the majority of our patients underestimated their blood glucose values, with 31/73 (42.5%) falling below the accuracy estimate and 20/73 (27.4%) exceeding it. Additionally, when comparing the real blood glucose result with a guessing patient's result using the criteria of (high, normal, and low), it was discovered that the majority of our patients were able to accurately estimate their blood glucose values 46/87 (52.9%), as opposed to 32/87 (36.8%) with underestimated and 9/87 (10.3%) with overestimated values. **Conclusion:** Based on the discovery that many people with type 2 diabetes are unable to estimate their blood glucose levels accurately, it is important for general dental practitioners to encourage patient to doing testing of their blood glucose level rather than relying on their perception to estimate their blood glucose level.

Keywords: Blood glucose estimation; self-monitoring; Diabetes mellites; emergency tooth extraction.

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Introduction:

The extraction of a tooth is usually the first action to take for those seeking emergency relief from dental pain, but it should be the last option on the treatment list. However, the prevalence of tooth extraction was a terrible problem in developing countries [1-3]. Dental caries and periodontal diseases accounted for the majority of tooth extraction

causes in Libyan populations [4]. Postoperative discomfort and wound infection are common after dental extractions, especially in diabetic patients with poorly controlled blood glucose levels [5-9]. Despite the fact that self-monitoring of blood sugar is frequently advised as a part of managing diabetes and is associated with statistically and clinically better glycemic control regardless of diabetes type or therapy [10], there is significant debate surrounding this expensive practice, especially for patients with type 2 diabetes. According to the American Diabetes Association's 1997 Clinical Practice Recommendations, patients with type 1 diabetes should be monitored at least three times per day, and those with type 2 diabetes who are receiving pharmacological treatment (insulin or oral medications) should be monitored daily [11]. For patients with type 2 diabetes who receive non-pharmacological treatment, no recommendations have been made (diet, exercise, or both). It has been argued that these recommendations lack evidence, especially regarding their ability to improve glycemic control [12,13]. Although a few small studies in patients with type 1 diabetes [14, 15] provide the majority of the evidence supporting the use of self-monitoring, its usefulness for these patients is still debatable [16–20], and there is even less evidence in favour of its use in patients with type 2 diabetes [13,19,21–28]. The American Diabetes Association's position statement states as a result: "Optimal frequency of self-monitoring of blood glucose for patients with type 2 diabetes is not known, but should be sufficient to facilitate reaching glucose goals" [29]. Even the possibility of self-monitoring harming one's mental health has been raised [30]. Fasting blood glucose is <100 mg/dl and Random is <144 mg/dl [31]. In addition to having diabetes symptoms, the patient is diagnosed with diabetes if their random blood glucose is 200 mg/dl or their fasting blood glucose is 126 mg/dl [32]. A cut-off point of 180 mg/dl for fasting blood sugar is used for any selective dental extraction. However, a cut-off point for an emergency tooth extraction for a random blood glucose level is 234 mg/dl (13 mmol/l). Patients with diabetes who have their blood sugar under strict control (70 mg/dl or less) are at risk for hypoglycemia [33]. Additionally, in an emergency, a dentist will see a large number of poorly controlled diabetes patients who need a tooth removed to relieve dental pain. Instead of performing a test, those patients primarily rely on perception or educated guesswork to estimate their blood glucose levels. The idea that diabetics cannot accurately estimate their own blood glucose levels is still unclear, as accurate guessers would not require this costly test. Research exploring patients with insulin-dependent diabetes has consistently shown that they cannot accurately estimate their blood glucose levels and those interventions such as feedback and blood glucose awareness training are only moderately effective at improving these estimations [34-37]. However, whether or not patients not using insulin can make accurate judgements about their blood glucose levels remains unknown. This is particularly relevant as research indicates that patients sometimes believe that they can perceive whether their blood glucose is too high or low and use these perceptions to modify their self-care daily practices. [38-40]. Therefore, the present study was designed to examine how accurate patients with diabetes are at guessing their own blood glucose levels in the context of a routine visit to their normal diabetic clinic.

Material and Methods:

This is a cross-sectional conducted at Laboratory of Genetic Engineering Department in College of Medical Technology and Diabetes and Heart Center laboratories in Derna City, Libya over a period of one month from (february2017 to March 2017). A meeting was conducted with clinic Doctors, Nursing and Demonstrators who willing to participating in this study by presenting the entire study design and objectives followed by a detailed protocol discussion. Pamphlets listing the specific inclusion and exclusion criteria were distributed to each attending Doctors, Nursing and Demonstrators. Advertisement describing the general selection criteria, study objectives and contact information, was distributed in the College of medical Technology and public places in Derna City. A date and time of visit was set up with subject after confirm the eligibility criteria.

Eligible Criteria:

- 1) patients who diagnosed with Diabetes mellitus and on/or insulin, hypoglycaemic tablets and diets.
- 2) Patients aged of 18 years and over.
- 3) all races and ethnicities are eligible for study enrolment.
- 4) Gender: males and females will be offered to participate in this study.

Sample size and sampling method: All eligible consecutive patients with diabetes attending a diabetic clinic were invited to estimate their blood glucose level prior to having it routinely measured. A total of **104** were participated in this study. Every participant invited to complete a questionnaire form that contains questions related to our study. This questionnaire was in Arabic simple form and contains items such as age, gender, educational level, estimated their blood glucose level using number and words (normal, high, low), and others. Participant who cannot read or understand the questions especial for the estimate their blood glucose level was invited to seek help from the nurse or Doctors in the clinic.

Measure of the main outcome: The percentage of subject blood glucose estimations that were outside ISO 15197:2003 accuracy criteria ($>\pm 15\text{mg/dl}$). Patients guessing values within range($\pm 15\text{mg/dl}$) after subtract guessing values from the real blood glucose result will be considered as accuracy guessing. Patients guessing over (15mg/dl) from real result will be considered as overestimated guessing and who guessing number below the

(15mg/dl) from real result will be considered as underestimated guessing. Moreover, we considered patients guessing as accuracy guessing if their guessing words (normal, high, and low) meet with real result range as a follow (70-140mg/dL) for words of normal, (>140mg/dL) for words of high, and (<70mg/dL) for words of low. We considered patients guessing as overestimated guessing if they used word High while the real blood glucose values still within normal range (70-140mg/dL) or low. We considered patients guessing as underestimated guessing if they used word Low while the real blood glucose values still within normal range (70-140mg/dL) or more.

Data collection: Blood sample was drowned from the patient hand.

Confidentiality: All teams involved in this study will deal with subject records with confidentiality. The names and the personal information of all subjects will be coded by secure numbers (all subjects will replace by secure number). Only collective data will be presented at professional meeting or in publications related to this project, the subject's identity will not be disclosed. All subject files related to this study will be securely stored.

Ethical Approval: All participants were voluntary and informed about the objectives of the study and informed consent was obtained from all the participants. The study was conducted in accordance with the Declaration of Helsinki.

Data analysis: Data analyses were carried out using the Statistical Packages for the Social Sciences (SPSS Version 26.0) Data was described using frequency tables, mean, and standard deviation. Chi-square and fisher exact tests for category variables were used. The level of significance was adopted at $P < 0.05$.

Results and discussion

Results:

A total of **104** diabetics patients were participated in our study who met our Eligibility Criteria.

Demographic profiles: As shown in Table (1). A total of 104 patients, 57(54.8%) males and 47(45.2%) females were participated in our study with over all mean of age 56.5 ± 9.98 years and over all mean of diabetes duration 12 ± 7.04 yeas. Patients with educational level more than high school were more frequents 70(67.3%) and patients who doing home testing to regulated their blood glucose level were low in number compare to who do not doing 36(37.9%),59(62.1%), respectively. Moreover, most of our patients they did not regular monitoring their blood glucose values at clinics 92(91.1%), 8(7.9%), respectively. Despite of, more than half of our patient (51(51.5%) were early diagnosed with diabetes millets, the comorbidity rate was high 43(43%), {24(24%) hypertension;3(3%) vascular diseases; more than one disease 15(15%); and hyperlipidemia1(1%)}. In general, our patients mainly use tablets to manage their blood glucose level than insulin 63(60.6%),36(34.6%), respectively. Smoking status of our patients are in good Shape since, 43(41.3%) of our patient they did not smoke compared to 15(14.4%) who were smoking. Most of participants patients they visit our study places to do fasting blood glucose measure76(73.1%), rather than doing random blood glucose measures 28(26.9%).

Guessing patients' profiles: As shown in Table (2). The overall mean of real blood glucose results for our patients were 203.9 ± 94.89 with range of 78-579 mg/dl, while the overall mean of guessing blood glucose results for the same patients was 178.32 ± 66.75 with range of 80-425 mg/dl. The mean difference was -125.58mg/dl which means that our patients estimated to their blood glucose values was less than the real results. However, 31/104(29.8%) of our patients can not able to guess their blood glucose level using an estimated number. Moreover, matching the real blood glucose result with a guessing patients result using a criterion of (± 15 mg/dl), it showed that most of our patient they underestimated their blood glucose values 31/73(42.5%), compare to 22/73(30.1%) with accuracy estimated and 20/73(27.4%) overestimated their blood glucose values. Also, when matching the real blood glucose result with a guessing patients result using a criterion of (high, normal and low), it showed that most of our patient cab be accuracy estimated their blood glucose values 46/87(52.9%), compare to 32/87(36.8%) with underestimated and 9/87(10.3%) overestimated their blood glucose values. The majorities of our patient's estimation to their blood glucose values were due to their feeling 59/104(56.8%), (symptom48(46.2%)), and what they eat 11(10.6%)), while 30/104(28.8%) was just for guessing. For a question of Did your guessing result match your real result before? only33 (31.7%) of our patients said yes which almost the same guessing percentage of (30.1%) of our patients having accuracy estimated using criteria of (± 15 mg/dl).

Patients' estimation profiles: As shown in Table (3). Variables such as gender; educational level; type of DM management; time of DM diagnosis; type of blood glucose investigation; duration of DM; regular of blood glucose monitoring; testing for blood glucose level at home and comorbidity, they did not show any statistically significant differences related to patients' estimation of their blood glucose levels using both Pearson chi-square and fisher exact tests. (P-values=0.72, 0.187, 0.502, 0.61, 0.114, 0.262, 0.834, 0.600, 0.530) respectively.

Table (1).

Patient's profile	N 104 (%)
Age(years) Mean±SD	56.5±9.98
Sex Male Female	57(54.8%) 47(45.2%)
Educational Level < high school High school ≥High school	25(24%) 9(8.7%) 70(67.3%)
Home testing Yes No	36(37.9%) 59(62.1%)
Time diagnosed(years) Early Late	51(51.5%) 48(48.5%)
Comorbidity Healthy Vascular disease Hypertension Hyperlipidemia More than one disease	57(57%) 3(3%) 24(24%) 1(1%) 15(15%)
Type of Blood glucose investigation Fasting random	76(73.1%) 28(26.9%)
Smoking Yes No	8(7.9%) 93(92.1%)
Do you regular measure your blood glucose level? Yes NO	41(41.4%) 58(58.6%)
Duration of diabetes by years Mean±SD Range ≤10 years > 10 years	12±7.04 1-30 years 49(53.3%) 43(46.7%)
Management Tablets Insulin	63(60.6%) 36(34.6%)

Table (2).

Guessing profiles	N (%)
Result of Blood glucose level Mean±SD range	203.9±94.89 78-579 mg/dl
Guessing BGL result by number Mean±SD Range Unable to guess by number	73/104 (70.2%) 178.32±66.75 80-425 mg/dl 31/104(29.8%)
Guessing/result matching by using number±15mg/dl Accuracy Under estimated Over Estimated	22/73(30.1%) 31/73(42.5%) 20/73(27.4%)
Guessing BGL result by rank I didn't Know	17/104 (16.3%)

Very high	8/104 (7.7%)
High	40/104 (38.5%)
Normal	35/104 (33.7%)
Low	4/104 (3.8%)
Guessing/result matching by using rank	
Accuracy	46/87(52.9%)
Under estimated	32/87(36.8%)
Over Estimated	9/87(10.3%)
Guessing was Due to	
Symptom	48/104(46.2%)
Type of food	11/104(10.6%)
Guessing	30/104(28.8%)
Most common symptom for guessing	
No symptom	48(46.2%)
Headache	16(15.4%)
Tired	9(8.7%)
Shaky	8(7.7%)
Dry Tongue	6(5.8%)
Hot	5(4.8%)
Thirsty	2(1.9%)
Urination	2(1.9%)
Others	5(4.9%)
Did your guessing match your result before?	
Yes	33(31.7%)
No	43(41.4%)

Table (3)

Patients' estimation Profiles	Accurate estimation (22)	Overestimation (20)	Underestimation (31)	Unable to estimation (31)	Total	p-value
Age Mean±SD	57.45±8.16	55±11.73	57.64±8.7	55.67±11.32	104	
Gender						
Male	15	12	19	11	57	0.72*
Female	7	8	12	20	47	
Educational						
<high school	5	6	10	4	25	0.187**
High school	1	4	3	1	9	
>high school	16	10	18	26	70	
Type of management						
Insulin	5	8	12	11	36	0.502*
Tablets	17	12	19	15	63	
Diagnosis Of DM						
Early	10	11	17	13	51	0.61*
Late	11	8	12	17	48	
Type of investigation						
Fasting	20	14	19	23	76	0.114*
Random	2	6	12	8	28	
Reason for guessing						
Symptom	14	9	10	15	48	
Type of eating food	1	4	6	0	11	
Guess	7	7	15	1	30	

Duration of DM by years						
≤10years	12	8	15	14	49	0.262*
>10years	9	12	16	6	43	
Do you regular measure your blood glucose level?						0.834*
Yes	10	8	11	12	41	
No	11	12	20	15	58	
Home testing						0.600*
Yes	10	7	9	10	36	
No	11	11	22	15	59	
Comorbidity						0.530*
Healthy	11	11	21	14	57	
Diseased	11	9	10	13	43	

*Pearson chi-square

**Fisher exact test

Discussion

The World Health Organization (WHO) estimates that 3% of the world's population (194 million) has diabetes, and that prevalence will double to 6.3% by 2025 [41]. In Libya in 2000, there were reportedly 88,000 diabetics, according to the WHO. By 2030, there will likely be 245,000 diabetics, according to estimates. Local epidemiological research found that the frequency of known diabetic individuals over 20 years of age in Libya was 3.8% [42]. The true prevalence is probably higher because 50% of type 2 diabetic people have undiagnosed diabetes. The result of our study showed that only (30.1%) of participated people have an accuracy estimation values when they matching the real blood glucose values with their guessing number using criteria of (± 15 mg/dl). The majorities of our patients(69.9%) they have guessing result out of criteria (± 15 mg/dl) and most of them more likely to have underestimation result (42.5%) compare to over estimation result (27.4%) and these finding is in agreement with study done by Frankum S et al [43], in which they showed that more of their subject have more likely to show underestimation result (43.3%) than overestimation result (17.3%) of their blood glucose values using different criteria(± 18 mg/dl). Moreover, our result is in consistency with Pettus J et al [44] result as they showed almost half (46%) of their patients had guessing values outside the criteria of (± 15 mg/dl).The result of the present study showing that one third (29.8%) of our patients can not able to guesses their blood glucose result by using a number. For that reason, we encourage our patient to use words(normal, high, and low) to express their blood glucose level and we find that more than half(52.9%) of our patient can get an accuracy guessing result of their real blood glucose values compare with(30.1%) of the same patients can get an accuracy guessing result when using a number to express the estimation of their blood glucose level. From this point, we can understand that using words (normal, high, and low) to judge blood glucose level are easier than using a number. However, our study result support the rationale behind these study to rely on patient perception of their blood glucose level due to the fact that most of diabetic patients they do not regular measured their blood glucose level and this fact is in consistence with our result since our patients in this present stud they do not do monitoring their blood glucose level at home (62.1%), or at clinic (58.6%).Furthermore, in my country Libya specially in my city Derna, dental practitioner every day have a hard conversation with a diabetic patients who come to the dental clinic to remove their tooth and they do not monitoring their blood glucose regularly or they do not believe that the tooth extraction may have an effect in their health status. Also, most of diabetics people in my city they measured their blood glucose in morning at Diabetes and Heart Center laboratory at the end of the month to have a free treatment if they available. In addition, in my city Derna, most of the dental care provider are privates' clinics which mainly works at afternoon time (after 4pm). For that reason, relying on patients' perceptions about their blood glucose values at emergency situation may accepted.

Conclusion:

The results of the current study point out that blood glucose testing, as opposed to estimation of blood glucose values, may be able to make a substantial contribution to aiding individuals in making better-informed decisions for the efficient management of their diabetes. Based on the discovery that many people with type 2 diabetes are

unable to estimate their blood glucose levels accurately, it is important for general dental practitioners to encourage patient to doing testing of their blood glucose level rather than relying on their perception to estimate their blood glucose level.

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