Awareness and Risk Factors of Diabetic Ketoacidosis among General Population in KSA: A Cross-Sectional Study

Dr. Faizah Omar Almahmudi[1], Dr. Reem Mohammed Bashowair[2*], Dr. Khalid Omair Alshehri[3], Dr. Abdulrhman Mahmoud Alhashme[4], Dr. Mohammed Hassan Alshaikhi[5], Dr. Mayada Saleh Altwerqe[6], Dr. Mohammed Hazem Tunsi[7], Dr. Eyad Anas Sedayo[8], Dr. Reaam Abdullah Alharbi[8], Dr. Salmeen Salah Binmahfouz[8], Dr. Souzi Abdelaziz Haroun[8], Dr. Rewaa Osama Moussa[8], Dr. Reem Abdullah Alghamdi[9], Sharifah Eissa Alshalan[10], Reem Abdualaziz Alanazi[10]

[1]*Family Medicine Consultant, Ministry of Health, Jeddah, KSA*
[2]*Family Medicine Senior Registrar, Bupa CareConnect, Jeddah, KSA*
[3]*Family Medicine Senior Registrar, Ministry of Health, Jeddah, KSA*
[4]*Gastroenterology, Service Doctor, KSMC, Riyadh, KSA*
[5]*Service Doctor, East Jeddah hospital, Jeddah, KSA*
[6]*General practitioner, department of Family Medicine, King Fahad Hospital, Jeddah, KSA*
[7]*General practitioner, Emergency medicine, King Fahad General hospital, Jeddah, KSA*
[8]*Medical intern, Ibn Sina National College, Jeddah, KSA*
[9]*Medical intern, King Abdulaziz University, Jeddah, KSA*
[10]*Nurse Specialist, ministry of health -ahssa branch, KSA*
Email: Reem.m.b@hotmail.com

Abstract: Objective: This research aims to determine Awareness and Risk Factors of Diabetic Ketoacidosis among General Population in KSA.

Methods: his study will employ a cross-sectional design to assess the awareness and risk factors of diabetic ketoacidosis (DKA) among the general population in the Kingdom of Saudi Arabia (KSA). The cross-sectional design is chosen to provide a snapshot of the current levels of awareness and the prevalence of risk factors associated with DKA within the population.

Results: The study included 350 participants. The study included 350 participants. The most frequent weight among them was 86-95 kg (n= 110, 31.4%), followed by 76-85 kg (n= 84, 24%), then 66-75 kg (n=54, 15.4%). The most frequent height among study participants was 171-180 cm (n= 117, 33.4%), followed by 161-170 cm (n= 105, 30%), then 150-160 cm (n=36, 10.3%). The most frequent gender among study participants was female (n= 183, 52.2%) and male (n= 167, 47.7%%). The nationality of the study participants most of them was Saudi (n= 315, 90%) and non-Saudi (n= 35, 10%). The employment of the study participants most of them were employed (n= 118, 33.7%), followed by unemployed (n= 94, 26.8%), then self-employed (n=71, 20.2%), and students (n=67, 19.1%). Participants were asked if they smoking. The most of them was smoke (n= 210, 60%) and non-smoke (n=140, 40%). The participants were asked about general awareness. Diabetic ketoacidosis. The results were an emergency event occurs a complication of diabetes and requires an urgent intervention (n=187, 53.4%), followed by normal physiological changes in response to diabetes (n=79, 22.6%), then a chronic complication of

diabetes, which occurs over a long time and doesn't require an urgent (n=68, 19.4%), and I don't know (n=16, 4.6%).
Conclusion: The study highlights a high level of awareness and knowledge about colorectal cancer among medical staff in Saudi Arabia. Most participants recommended colorectal cancer screening for their families and friends, emphasizing the importance of early detection and preventive measures in reducing cancer mortality rates. However, there are still barriers such as limited resources and misconceptions that need to be addressed to further improve screening participation rates.

1. Introduction

Elevated blood glucose levels caused by insulin resistance, decreased insulin action in the circulation, or an increase in the synthesis of hormones that regulate blood sugar levels are the hallmarks of diabetes mellitus (DM), a cluster of metabolic diseases [1]. A potentially fatal consequence of both type 1 and type 2 diabetes is diabetic ketoacidosis (DKA). Not having any insulin or forgetting to take it might hasten the onset of diabetic ketoacidosis (DKA). Factors such as socioeconomic hardship, age (13–25 years), gender (females more so than males), and mental comorbidities including depression and eating disorders contribute to the 20% recurrence of DKA [1,2,3,4].

Nevertheless, it almost never happens in the absence of triggering circumstances. Dyspnea(57%), polyuria(98%), weight loss(81%), muscular tiredness(62%), vomiting(46%), and previous illness(40%) were among the clinical symptoms seen in the DKA patients. Coma and death may result from respiratory failure and severe stomach pain, respectively, brought on by these symptoms. Serious problems in the gastrointestinal system can also induce respiratory failure. Diabetic ketoacidosis (DKA) affects anywhere from 16% to 80% of children with a new diabetes diagnosis, depending on the region [2,3,5].

Among European nations, Romania (67%), Hungary (23%), and Finland (22%), have a comparatively high prevalence of diabetic ketoacidosis (DKA). In addition, from 1990 to 1999, the prevalence of DKA was 80% in the UAE, 20.9% in Kuwait, and 44.9% in Saudi Arabia, all of which are nations in the Arabian Gulf. In spite of the fact that DKA incidence rates increased from 2011 to 2013, very little is known about the condition in Riyadh [6].

Having a good primary care physician and access to respectful and competent primary care facilities are practically requirements for the safety and well-being of our children due to the significantly improved health outcomes that have been established. The incidence rate of DKA is lower when T1DM is initially diagnosed, according to several pieces of research from throughout the globe that propagate and raise knowledge about diabetes and DKA. One possible explanation for the prevalence of DKA is that parents are unaware of the signs and symptoms of hyperglycemia. Regression of the risk of diabetic ketoacidosis occurs in the presence of a first-degree relative who has diabetes. Researchers in Poland found that compared to adults, the risk of DKA was two times higher in children less than three years old [7–10].

2. METHODS

Study design

This study will employ a cross-sectional design to assess the awareness and risk factors of diabetic ketoacidosis (DKA) among the general population in the Kingdom of Saudi Arabia (KSA). The cross-sectional design is chosen to provide a snapshot of the current levels of awareness and the prevalence of risk factors associated with DKA within the population.

Study approach

The study will be conducted across various regions of KSA, including urban and rural areas. Data collection will take place in primary healthcare centers, public places (such as shopping malls and parks), and through online surveys to ensure a diverse and representative sample.

Study population

The target population for this study includes adults aged 18 years and above who are residents of KSA. Participants will include individuals with and without diabetes to assess general awareness and risk factors related to DKA.

Study sample

A multistage sampling technique will be used to select participants. In the first stage, regions within KSA will be stratified into urban and rural areas. In the second stage, primary healthcare centers and public locations will be randomly selected within these regions. A convenience sampling method will then be used to recruit participants at these locations. Additionally, an online survey will be disseminated to reach a broader population. The sample size will be calculated based on the prevalence of DKA awareness from previous studies, with a confidence level of 95% and a margin of error of 5%.

Study tool

For the current study, the questionnaire was adopted for data collection, which was also categorized as a study tool.

Data collection

Data will be collected using a structured questionnaire administered in person and online. The questionnaire will consist of three sections:

- Demographic information (age, gender, education level, and medical history).
- Awareness of DKA (knowledge of symptoms, causes, prevention, and treatment).
- Risk factors for DKA (such as diabetes type, medication adherence, and lifestyle factors).

Data analysis

Data will be analyzed using SPSS software. Descriptive statistics (frequencies, percentages, means, and standard deviations) will be used to summarize the demographic data and levels of awareness and risk factors. Chi-square tests and logistic regression analysis will be employed to identify associations between demographic variables and awareness or risk factors. A p-value of <0.05 will be considered statistically significant.

Ethical considerations

Ethical approval for the study will be obtained from the relevant institutional review board (IRB) in KSA. Informed consent will be obtained from all participants before data collection, ensuring that participation is voluntary. Participants will be assured of the confidentiality and anonymity of their responses, and they will have the right to withdraw from the study at any time without any consequences. Data will be securely stored and only accessible to the research team.

3. RESULTS

The study included 350 participants. The most frequent weight among them was 86-95 kg (n= 110, 31.4%), followed by 76-85 kg (n= 84, 24%), then 66-75 kg (n=54, 15.4%). Figure 1 shows the weight distribution among study participants. The most frequent height among study participants was 171-180 cm (n= 117, 33.4%), followed by 161-170 cm (n= 105, 30%), then 150-160 cm (n=36, 10.3%). Figure 2 shows the height distribution among study participants. The most frequent gender among study participants was female (n= 183, 52.2%)

and male (n= 167, 47.7%%). Figure 3 shows the distribution of gender among study participants.

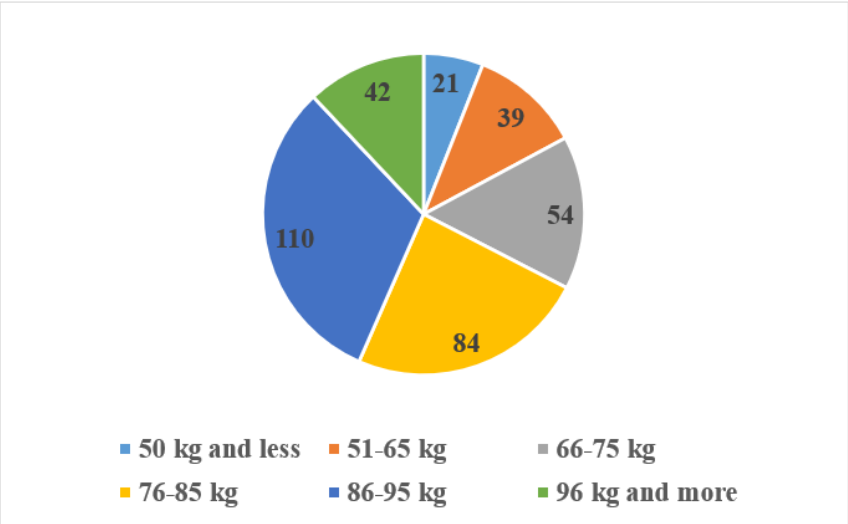

Figure 1: Weight distribution among study participants

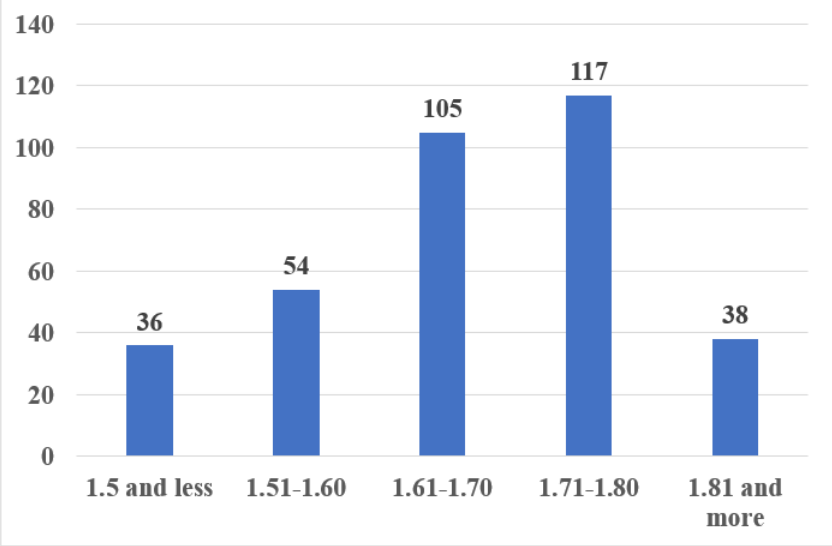

Figure 2: Height distribution among study participants

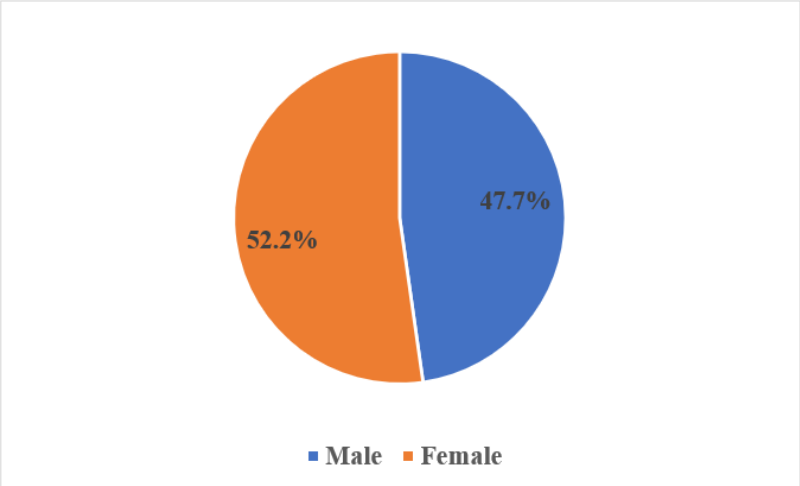

Figure 3: Gender distribution among study participants

The nationality of the study participants most of them was Saudi (n= 315, 90%) and non-Saudi (n= 35, 10%). Figure 4 shows the nationality distribution among study participants.

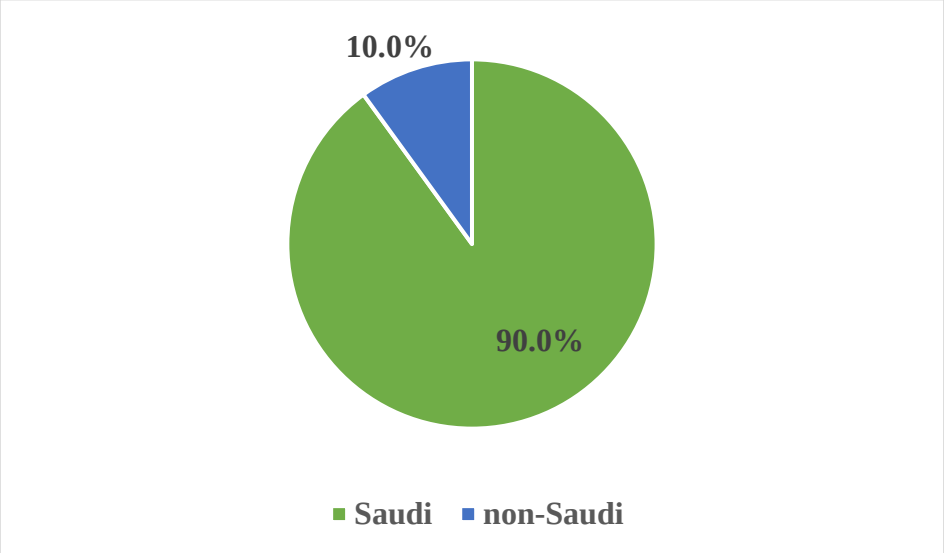

Figure 4: Nationality distribution among study participants

The employment of the study participants most of them were employed (n= 118, 33.7%), followed by unemployed (n= 94, 26.8%), then self-employed (n=71, 20.2%), and students (n=67, 19.1%). Figure 5 shows the employment distribution among study participants.

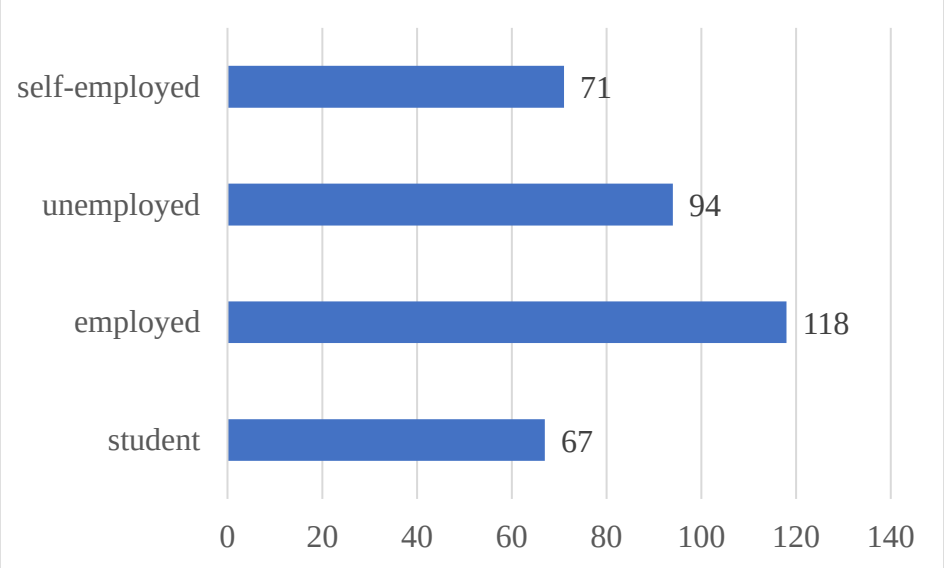

Figure 5: Employment distribution among study participants

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Participants were asked to assess their general awareness. Their responses and results are presented in Table 1.

Table 1: Diabetic ketoacidosis (DKA) is considered			
General Awareness	yes	no	I don't know
DKA is considered as a life-threatening condition	316 (90.3%)	24 (6.9%)	10 (2.9%)
DKA may affect other systems in the body, like the brain and heart	313 (89.4%)	27 (7.7%)	10 (2.9%)
DKA affects children only	333 (95.1%)	13 (3.7%)	4 (1.1%)

Participants were asked about signs and symptoms. Their responses and results are presented in Table 2.

Table 2: Signs and symptoms			
item	Yes	no	I don't know
Fatigue and tired	330 (94.3%)	15 (4.3%)	5 (1.4%)
Unconsciousness	327 (93.4%)	16 (4.6%)	7 (2%)
Nausea	334 (95.4%)	9 (2.6%)	7 (2%)
Stomachache	339 (96.9%)	7 (2%)	4 (1.1%)
Rapid or difficulty breathing	337 (96.3%)	8 (2.3%)	5 (1.4%)
characteristic breath smell	323 (92.3%)	21 (6%)	6 (1.7%)

Participants were asked about DKA complications. Their responses and results are presented in Table 3.

Table 3

DKA Complications	Yes	No	I don't know
Respiratory Failure	329 (94%)	13 (3.7%)	8 (2.3%)
Coma	333 (95.1%)	12 (3.4%)	5 (1.4%)
Death	321 (91.7%)	20 (5.7%)	9 (2.6%)

4. DISCUSSION

The healthcare system bears the brunt of several health complications caused by diabetes mellitus (DM). The International Diabetes Federation reports that Saudi Arabia has the seventh-highest incidence of diabetes worldwide [11]. One of the most prevalent endocrine crises, diabetic ketoacidosis (DKA) is a significant consequence of diabetes mellitus (DM) [12]. Hyperglycemia, elevated ketone levels, acidemia, electrolyte imbalance, and dehydration are the end results of peripheral insulin resistance, which is caused by inadequate insulin levels and an increase in insulin counter-regulatory hormones [13]. Common symptoms reported by patients include nausea, vomiting, and an unpleasant taste or smell in the mouth reminiscent of fruit. Furthermore, traditional diabetic symptoms including thirst and frequent urine might also manifest in certain individuals [14]. Medication non-adherence, infections, psychological or physical stress, and the use of corticosteroids or other drugs known to raise blood glucose levels are all potential causes of diabetic ketoacidosis [15]. According to reports, the mortality rate after one DKA episode is 5.2%, and it increases sixfold with five or more admissions of DKA [16]. The last 20 years have seen a meteoric rise in the readmission rates for DKA [17].

Definition and epidemiology

Hyperglycemia, hyperketonaemia, and metabolic acidosis are the hallmarks of diabetic ketoacidosis, a serious acute metabolic consequence of diabetes mellitus. High insulin needs lead to insulin deficiency in patients [18–19]. Excessive breakdown of fat causes an overabundance of ketone bodies due to insulin insufficiency. Even if self-care for diabetic individuals has improved, 16% of all fatalities caused by diabetes are attributable to DKA, and 14% of all diabetic hospital admissions are due to DKA [18]. About 3% of individuals with type 1 diabetes first experience DKA; the prevalence is two episodes per 100 patient-years of diabetes; and DKA is prevalent in adults with type 1 diabetes. Although less common, it may

also occur in patients with type 2 diabetes [20-21]. It is likely that poor nations have a higher incidence of diabetic ketoacidosis compared to industrialized ones, however this is not yet established [22]. White people are more likely to have type 1 diabetes, which increases their risk of developing DKA. It is unclear why females have a slightly higher risk of developing DKA compared to men. Recurrent diabetic ketoacidosis (DKA) is common in young women with type 1 diabetes and is mostly caused by not taking insulin as prescribed [20,23]. Although DKA may occur in individuals of any age, it is more common in younger patients and teens with type 1 diabetes than in adults. It is possible to intervene between the beginning of symptoms and the development of DKA, but several variables affect the risk of DKA in children and youth (ethnic minority, uninsured, underweight, prior infection, delayed treatment, etc.) [23].

Pathophysiology

Ketoacidosis is characterized by aberrant physiology in diabetic patients and is caused by insulin resistance, which in turn causes hyperglycemia, hyperketonemia, hyperosmolarity, and electrolyte abnormalities. This abnormal physiology is accompanied by an increase in hormones that push the body into a catabolic condition. Among these hormones are the catecholamines (epinephrine and norepinephrine), glucagon, and growth hormone [24]. A lack of insulin activity or increased demand for insulin, which may happen as a result of missing doses, incorrect insulin administration, or infections in a diabetic patient, is often the event that most frequently triggers diabetic ketoacidosis [25]. Intracellular hunger and famine set in when most cells are unable to use glucose for energy due to an inability to transfer glucose inside cells. As a result, the majority of cells start using free fatty acids (FFA) for energy [26-27]. Insulin prevents adipocytes from being lipolyzed into glycerol and free fatty acids, which leads to an excess of these substances in the circulation when insulin is absent [22]. The liver receives these freely floating FFA and sends them to the mitochondria for oxidation, where they produce ketone bodies such as acetone, beta-hydroxybutyrate, and acetoacetate. When insulin levels are too low, the metabolic process becomes unchecked, leading to an excess of ketones [28].

Triglycerides are more common than ketones in simple cases of diabetes or hunger. Ketosis does not set in because the body's elimination mechanisms are able to handle the excess ketones [29]. In addition to growth hormone, catecholamines, glucagon, and cortisol all dramatically raise blood glucose levels by stimulating gluconeogenesis and glycogenolysis [29]. Stress, in the form of infections (particularly those of the lower respiratory and urinary tracts), trauma, myocardial infarction, acute pancreatitis, burns, surgery, strokes, substance misuse, etc., can also trigger the release of these hormones [30]. Insulin counter-regulatory hormones such as glucagon, catecholamines, cortisol, and growth hormone are increased when these stresses trigger the production of inflammatory cytokines [31]. Hormones like these push the body into a catabolic state, which makes hyperglycemia worse by increasing the rate of glucose synthesis via lipolysis and proteolysis [32].

Causes

The most prevalent causes of diabetic ketoacidosis are infections, noncompliance with insulin treatment, and a recent diabetes diagnosis [33]. In patients with type 1 diabetes, medication nonadherence is the leading cause of diabetic ketoacidosis, while infections are the leading cause in people with type 2 diabetes [34]. The use of illegal substances like cocaine and methamphetamine, as well as antipsychotic medications like clozapine, risperidone, and olanzapine, as well as vascular events including acute coronary syndrome, cerebrovascular accidents, critical limb ischemia, intestinal ischemia, and shock, may also contribute [33].

5. CONCLUSION

The study highlights a high level of awareness and knowledge about colorectal cancer among medical staff in Saudi Arabia. Most participants recommended colorectal cancer

screening for their families and friends, emphasizing the importance of early detection and preventive measures in reducing cancer mortality rates. However, there are still barriers such as limited resources and misconceptions that need to be addressed to further improve screening participation rates.

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