

Diabetic ketoacidosis (DKA) hospitalizations and reduce length of stay of an adult patient with diabetic ketoacidosis attending the emergency room of Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021

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Abstract

Background

Diabetic Ketoacidosis (DKA) is a serious and potentially a fatal complication of diabetes mellitus. Diabetic Ketoacidosis (DKA) is a metabolic emergency characterized by the triad of hyperglycemia, high-anion gap metabolic acidosis and ketonemia. Despite its multifactorial etiology, DKA is known to be a preventable acute complication of diabetes mellitus specifically through patient education. Diabetic ketoacidosis(DKA) is the most common hyperglycemic emergency and causes the greatest risk for death in patients with diabetes mellitus, almost a third of the cases occur among those with type 2 diabetes. Although mortality rates from DKA have declined to low levels in general, it continues to be high in many developing countries. DKA is characterized by hyperglycemia, metabolic acidosis and ketosis. Proper management of DKA requires hospitalization for aggressive intravenous fluids, insulin therapy, electrolyte replacement as well as identification and treatment of the underlying precipitating event along with frequent monitoring of patient's clinical and

laboratory states. **Aim of the study:** To assessment the of Diabetic ketoacidosis(DKA) hospitalizations and reduce length of stay of an adult patients with diabetic ketoacidosis attending the emergency room of Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021. **Method:** cross sectional study of patients with DKA to define the clinical and biochemical characteristics of Diabetes Ketoacidosis at Diabetic Center in Al-Noor Hospital in Makkah. The study included physicians working in the diabetic center that care for DKA patients and follow up diabetic patients. They identified all patients from 2021 with DKA from the medical records. **Result:** There was statistically significant difference in mean of LOS across all years (<0.05). The length of stay in our institute was statistically and graphically shorter than national benchmark to reach 15 hour shorter in 2021. BY doing a multivariate regression analysis, it has been found that presence of ketoacidosis, anion gap, change in bicarbonate level and resorption of DKA in hours are statistically significant and regarded as determinants of LOS in DM patients. **Conclusion:** Decrease length of hospital stay is highly dependent on severity of condition, metabolic derangement the clinical pathways are known to decrease practice variations and improve several essential patient-, practicing physician.

Keywords: Implementation, clinical practice pathway (CPP), diabetic ketoacidosis (DKA), hospitalizations.

INTRODUCTION

Saudi Arabia has probably the most highest rates of diabetic ketoacidosis around the world, with different searches showing that in recently analyzed sort 1 diabetes, these rates are 40% in the Eastern region,[1]55% in the Northwestern region[2] and 67.2% in Riyadh city.[3]

Diabetic ketoacidosis diabetic ketoacidosis is an intense difficulty of uncontrolled diabetes mellitus that is related with expanded bleakness and mortality. Epidemiological searches have discovered that paces of diabetic ketoacidosis in new-onset type 1 diabetes differ between countries.[4] While searches from Denmark, Kuwait, Canada and Germany have discovered the paces of diabetic ketoacidosis in recently analyzed type 1 diabetes to be 17.9%, 24.8%, 25.6% and 35.2%, individually, in United Arab Emirates, its rate was 80%.[5,6]

diabetic ketoacidosis is perhaps the most fearsome complications of diabetes, with death paces of up to 5% in developed nations.[7,8] up to 30% in less favored health frameworks.[9] and over 90% when convoluted by cerebral edema[10]. Death is usually credited to co-morbidities, yet iatrogenic hypokalemia and liquid over-burden are once in a

while responsible.[11]. In this manner, the careful use of acknowledged administration norms in diabetic ketoacidosis is an abrogating priority. For this specific explanation, different global, evidence-based guidelines have suggested the utilization of specific hospital protocols for the care of these patients. [7,2] Notwithstanding medical advances in its DKA management, and diagnosis, diabetic ketoacidosis stays a significant reason for hospital admissions and mortality in kids and grown-ups, especially in developing countries. Truth be told, as of late, there has been a huge expansion in the paces of diabetic ketoacidosis-related hospital admissions in a few areas worldwide.[12,13] The most habitually revealed markers that relate with hospitalization for diabetic ketoacidosis are poor glycemic control, lower financial status, presence of psychiatric conditions and female gender.[14]

In spite of the fact that there are all around characterized rules for both diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar state (HHS), it could likewise be found hyperglycemic states with mixed features, depending upon each given case and the basic reason for decompensating.[15] The mortality of DKA and HHS goes from under 5 to 11%, respectively.[16] Moreover, patients with type 2 diabetes mellitus could likewise have DKA emergencies under certain intense pressure catabolic conditions such injury, medical procedure or infection.[17,18]

Literature Review

Some authors (A. Zugasti) [19] have recently announced information on our local area about patients conceded to the emergency department (ED) in university hospital. They reported an frequency of 8.09 scenes of DKA in 105 inhabitants and a death rate of 6.52%. All the more other authors have likewise told a lower DKA death rate at 28 days, ranging somewhere in the range of 3.4%⁸ and 2.65%.⁹ Perhaps, these rates may be more like what could be deduced expected in current step by step clinical practice. Notwithstanding, most accessible information on this issue came from referred to manuscripts prior to 1985. Therefore, there are not recent studies that show the impact of improvements in the therapy on mortality in grown-ups with DKA. [20,21]

Wang et al.[22] showed a general lessening of DKA mortality of 4.4% each year/105 inhabitants. These outcomes update the information on past decades.[23,24] Ko et al.[25] announced an expanded in ED visits from 1995, yet in setting of a reformist decrease of DKA mortality since the 1980s. In any case, frontal area that the mortality reached 12.2% in patients treated somewhere in the range of 1996 and 2002. Although this death rate is high for the present norms, that may be molded by the low number of patients at last remembered

for the searches – a similar issue recognized in different searches of closer geological scope to ours.[25,26]

Razavi Z (2015) announced that the recurrence of hospitalizations for DKA was higher in summer and autumn time and lower in spring. In any case, contrasts were not huge. We have recently shown that the recurrence of T1DM was higher in summer (34%)[27](210. Since most of DKA cases happen in patients without a known history of diabetes, its irregularity is likewise a also a measure of new onset T1DM irregularity. Along these lines, we conclude that seasonal variation of DKA and T1DM in our district is somewhat unique in relation to those revealed in the literature, while at the same time affirming our past discoveries[28].

Similar to the results of Butalia et al.[29], hospitalization because of ketoacidosis was higher in December and September than in different months. In this way, maybe healthcare experts' readiness ought to be expanded, especially during specific months of the year. Polyuria, polydipsia, stomach torment, regurgitating, and modified degree of cognizance were the commonest presenting complaints of DKA predictable with discoveries in past research[30]

Freire et al.[31] who reported nonappearance of contrasts between internal lengths of stay of moderate or potentially extreme DKA scenes (expanded length of stay was characterized as ≥ 3 days in ICS and ≥ 6 days in clinical ward). Our ICS confirmation rate came to practically half, steady with other past research that show the standard affirmation of DKA patients in IC units.20 Criteria for ICS affirmation were extreme DKA, yet additionally any serious ailment.

Lone et al.[32] revealed that 55% of kids giving DKA were over 10 years of age. Naeem et al.[30] (16) by inspecting 373 pediatric DKA patients revealed that number of attacks were most noteworthy in patients who matured 10 - 14 years. This finding is in opposition to the previous authors who showed that diabetic ketoacidosis was more common in younger ages [33].

In accordance with our past research in 2010[34], serious DKA was seen in 47.2% of patients which differs from other studies as they found a lower number of severe DKA contrasted and gentle and moderate sort. For example, Schober et al.[35] detailed that of 1,238 Austrian youngsters with DKA, 383 (11.5%) had serious DKA. In the research of Oyarzabal et al.[36] extreme DKA was analyzed in 17.8% DKA scenes. The DKA scenes were serious in 49.4%, predictable with the consequences of Guisado-Vasco et al'.

Research.[37] . The conceivable explanation might be because of an absence of admittance to healthcare experts for the research. Populace or deferred finding by primary care doctor . Acknowledgment of DKA can be improved by expanding medical services arrangement and offices just as healthcare experts' sharpness.

Rationale

Diabetic ketoacidosis (DKA) are acute metabolic complications of diabetes mellitus that can occur in patients with both type 1 and 2 diabetes mellitus. an audit was conducted in October to December 2013 on Diabetic ketoacidosis patients and data revealed that readmission rates for Diabetic ketoacidosis patients after 30 days of discharge was very high at 13.70% compared to the international benchmark of 2.8%., is a life-long disorder which can be management by insulin therapy, and electrolyte replacement along with the continuous patient monitoring using available laboratory tools to predict the resolution of the hyperglycemic crisis. The pathway aimed to facilitate evidence based practice in managing Diabetic ketoacidosis patients, provide patients with uniform care and ensure effective and safe management of Diabetic ketoacidosis.

1.3 Aim of the study

- To assessment the of Diabetic ketoacidosis(DKA) hospitalizations and reduce length of stay of an adult patients with diabetic ketoacidosis attending the emergency room of Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021.

Objectives

- To determine the length of stay and ICU transferee in Diabetic center in Jeddah at Saudi Arabia
- To determine the resolution of Diabetic ketoacidosis

Methodology

Study area :

The study has been carried out in Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021, which is It's one of the leading centers in KSA to teach and evaluate diabetic patients, it starts to provide services in 1994, the center services evaluate diabetes, teach diabetic patients, conduct researches on diabetes and held scientific sessions and seminars all type 1 and type 2 diabetes patients with DKA attending clinic or the ER at Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021 aged 12 years and above. Cases of DKA were identified by American Diabetes Association (ADA 2006) criteria for definition of DKA metabolic acidosis is often the major finding, while the serum glucose

concentration is generally below 800 mg/dL (44 mmol/L). However, serum glucose concentrations may exceed 900 mg/dL (50 mmol/L) in patients with DKA who are comatose. We reviewed all the cases and classify them according to these criteria, with previously demonstrated validity.

Study population:

Patients with DKA attending to the ER at Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, which is a tertiary center serving patients throughout the period of the study and accept to participate in the study.

Study design :

Cross sectional study of patients with DKA to define the clinical and biochemical characteristics of Diabetes Ketoacidosis in Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, 2021

Inclusion criteria:

- Type I DM patients presenting with DKA above 12 years (males and females).
- Availability of clinical data regarding DKA characteristics, glycemic data
- ICU admission

Exclusion criteria: Referral or consultation from outside the hospital.

Sample size:

The current study was conducted on 576 patients admitted DKA with the pathway from January 2021. Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah which is a tertiary center serving patient over three year's period. They have been collected through a secured computerized data basest in referral hospital. Rec ruined according to the inclusion, exclusion criteria shown below.

Study of the Intervention(s)

All type 1 diabetes patients with DKA who admitted at Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah aged above 12 years. Cases of DKA were identified by American Diabetes Association (ADA 2006) criteria for definition of DKA. A follow up audit was performed in all DKA Patients admitted from January 2021 to see the continuation of the effective use of the DKA pathway and improvements in the parameters taken into consideration in the previous Audit .

Data Collection technique :

The study included physicians working in the diabetic center that care for DKA patients and follow up diabetic patients. They identified all patients from January 2021 with DKA from the medical records for enrollment in this retrospective cohort study. Case report forms

were completed for each patient. Following variables were collected from the medical record. demographic and clinical data (Age, sex), type and duration of diabetes, type of insulin and doses, ICU admission , BMI, complications, duration of hospital stay, investigations like antibodies ,electrolytes changes like plasma glucose (mmol/L) arterial pH, serum bicarbonate (mmol/L), urine ketones and anion gap. Definitions were established for all variables to ensure standardization of data collection .

Data entry and analysis

Data retrieved were processed using the Statistical Package for Social Sciences (SPSS) program version 25. Data of numerical values were compared using chi-square t-tests while the categorical comparisons were tested by Fisher exact test. A P-value below 0.05 was regarded as significant. awkward- selected multivariable logistic regression analysis in models that included statistically significant variables significant from the univariate analysis with $P < 0.10$ was utilized to identify predictors.

Ethical Considerations:

This study was conducted under the and approved hospital director, To be conducted in Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah which is a tertiary center serving patients, Makkah, Saudi Arabia Confidentiality of information was assured and the data were accessed only by the investigators involved in the study.

No consent from the patient is required for this project.

Budget : The research has been self-funded.

Results.

A total number of patients were 576 patients admitted from 2021

Table (1): shows the demographic and clinical data of study participants of (n=576)

| Table 1: Demographic and clinical data | | |
|-----------------------------------------------|----------|----------|
| N=576 | N | % |
| Number of patients | | |
| 2015 | 79 | 13.7 |
| 2016 | 119 | 20.6 |
| 2017 | 124 | 21.5 |
| 2018 | 128 | 22.2 |
| 2019 | 126 | 21.8 |
| Sex | | |
| Female | 417 | 72.4 |
| Male | 159 | 27.6 |
| BMI | | |
| Underweight | 105 | 18.2 |
| Normal | 272 | 47.2 |
| Overweight | 82 | 14.2 |

| | | |
|-----------------------|--------------|------|
| Obese | 117 | 20.3 |
| Range | 10.94-67.55 | |
| Mean±SD | 24.266±7.866 | |
| GAD ABS | | |
| Negative | 25 | 4.3 |
| Positive | 185 | 32.1 |
| NA | 366 | 63.5 |
| ICA | | |
| Negative | 83 | 14.4 |
| Positive | 105 | 18.2 |
| NA | 388 | 67.4 |
| IAA | | |
| Negative | 75 | 13.0 |
| Positive | 112 | 19.4 |
| NA | 389 | 67.5 |
| HYPOTHYROIDISM | | |
| Negative | 468 | 81.3 |
| Positive | 108 | 18.8 |
| ICU /Admission | | |
| No | 534 | 92.7 |
| Yes | 42 | 7.3 |
| Complication | | |
| Negative | 512 | 88.9 |
| Positive | 64 | 11.1 |

Shows table1 regarding the number of patients the majority of patients were collected in a year 2021, followed in year 2019 were (22.2%and 21.8%). Most of the admitted patients were female (72.4%). Regarding the majority of BMI of the patients in the normal were(47.2%) while the Range(10.94 to 67.55) Mean± SD(24.266±7.866) the mean BMI was 24 kg/m². Throughout all years, number of ICU/ admission was indicated in Yes were (7.3%) patients while No were(92.7%), regarding complications were found in 64(11.1%) patients.

Table (2) Description of the laboratory data

| Table 2: laboratory data | | |
|--------------------------------------------------------|--------------|------------------|
| | Range | Mean ± SD |
| AG | 13 - 40 | 26.361 ± 5.572 |
| HCO₃ | 1 - 26 | 9.044 ± 4.590 |
| BS | 5 - 53 | 26.894 ± 8.493 |
| KET | 1 - 4 | 2.837 ± 0.709 |
| Resorption of DKA Normalization of AG/hours | 1 - 72 | 16.154 ± 13.314 |
| HbA1C before ADMISSION | 5.7 - 19.8 | 11.706 ± 2.443 |
| LANTUS DOSE | 10 - 60 | 33.939 ± 11.285 |
| ULTRASHORT DOSE | 0 - 30 | 14.780 ± 6.280 |
| LEVEMIR DOSE | 10 - 52 | 23.481 ± 11.413 |
| VIT. D | 7.5 - 138 | 39.857 ± 23.724 |

| | | |
|--------------|-------------|-----------------|
| TSH | 0.03 - 43 | 3.689 ± 5.431 |
| FT4 | 0.4 - 21.38 | 12.712 ± 4.192 |
| CREAT | 27 - 458 | 73.521 ± 35.546 |

In table 2, show of the laboratory data and the data rang were(5.7 to 19.8). The mean of HBA1c prior to admission is above normal 11.706 ± 2.443 . Regarding the mean and standard deviation of Resorption of DKA Normalization of AG/hours in our study were 16.154 ± 13.314 (1to 72). While the mean and standard deviation of the VIT. D(39.857 ± 23.724) and data rang(7.5-12. Ketoacidosis Most of cases were either mild or moderate (36.5%, 5738%) respectively as shown in figure

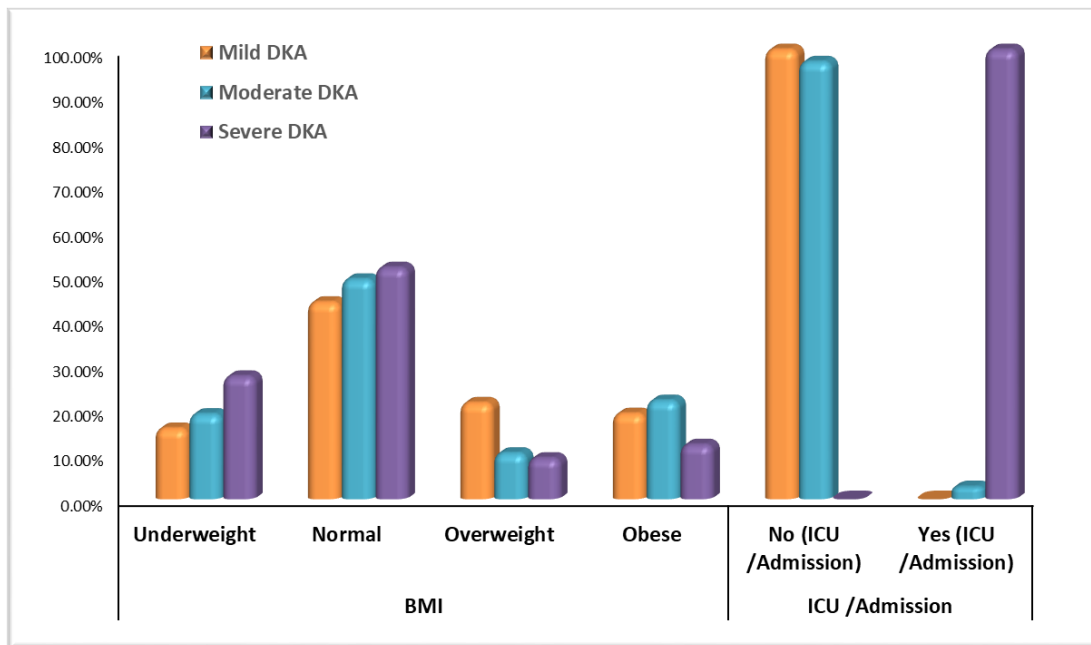


Figure 1: Relationship between DKA severity and study variables (BMI and ICU admission).

Testing study variables according to the severity of PH, it has been found that sex (female), normal and underweight and finally ICU admission are statistically significant with severe DKA. IN figure 1.

Table (3) Describe of the Multi Logistic Regression between PH as depending variables(Constant), Length of Stay (day), AG, HCO₃, BS, KET, Resoption of DKA Normalization of AG/hours, HbA1C PRIOT TO ADMISSION, VITD , TSH, FT4, CREAT ICU /Admission)and Unstandardized Coefficients, Standardized Coefficients

| Table 3: Regression analysis | | | | | | | | |
|---------------------------------------------|-----------------------------|-------|----------------------------|---------|---------|--------|---------|----------------|
| Dependent variable: PH | Unstandardized Coefficients | | Standardize d Coefficients | T-test | | ANOVA | | R ² |
| | B | SE | Beta | t | P-value | F | P-value | |
| (Constant) | 7.176 | 0.056 | | 128.462 | <0.001* | 67.125 | <0.001* | 73.90% |
| Length of Stay (day) | 0.012 | 0.004 | 0.108 | 3.071 | 0.002* | | | |
| AG | -0.001 | 0.001 | -0.040 | -0.902 | 0.368 | | | |
| HCO ₃ | 0.014 | 0.002 | 0.466 | 9.142 | <0.001* | | | |
| BS | 0.000 | 0.001 | 0.003 | 0.085 | 0.932 | | | |
| KET | -0.014 | 0.007 | -0.074 | -1.896 | 0.059 | | | |
| Resoption of DKA Normalizati on of AG/hours | -0.001 | 0.000 | -0.117 | -2.885 | 0.004* | | | |
| HbA1C PRIOT TO ADMISSION | -0.002 | 0.002 | -0.033 | -0.968 | 0.334 | | | |
| VITD | 0.000 | 0.000 | -0.052 | -1.478 | 0.141 | | | |
| TSH | -1.125E-04 | 0.001 | -0.005 | -0.133 | 0.894 | | | |
| FT4 | 0.001 | 0.001 | 0.050 | 1.293 | 0.197 | | | |
| CREAT | 0.000 | 0.000 | 0.003 | 0.080 | 0.936 | | | |
| ICU /Admission | -0.204 | 0.017 | -0.420 | -11.998 | <0.001* | | | |

Table 3 show all the final model is affect by explain the regression by R² (73.90%) a significant relation between Unstandardized Coefficients and Standardized Coefficients and dependent variables PH . Were F (67.125)and P-value=0.001 .

Regarding the unstandardized Coefficients how that is a significant relation between unstandardized Coefficients and Constant, Length of Stay (day), HCO₃, BS, KET, Resoption of DKA Normalization of AG/hours, ICU /Admission were P-value=<0.001, 0.002, <0.001,

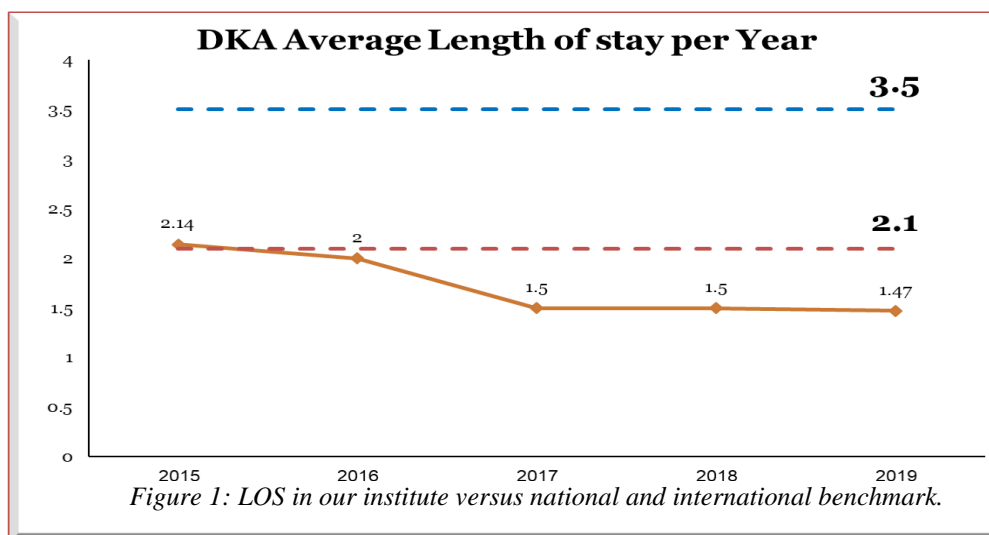
0.004, <0.001 and(B = 7.176, 0.012,0.014,-0.001,-0.204 while SE 0.056, 0.004, 0.002,0.000,-0.204)

Table (4): Describe of the mean and standard deviation of LOS across all years of study.

| Table 5: mean and standard deviation of LOS across all years of study. | | | | | | | |
|------------------------------------------------------------------------|---------|----------------------|-------------|--------------------------------------|---------|-------------------------------------------|---------|
| Years | No | Length of Stay (day) | | | | | |
| | | Range | Mean±SD | One sample T-test | | | |
| | | | | National benchmark test value=2.1 | | International benchmark test value=3.5 | |
| | | | | t | P-value | t | P-value |
| 2015 | 79 | 1-6 | 2.147±1.179 | 0.354 | 0.724 | 10.200 | <0.001* |
| 2016 | 119 | 1-6 | 2.018±1.280 | 0.699 | 0.486 | 12.630 | <0.001* |
| 2017 | 124 | 1-4 | 1.551±0.842 | 7.261 | <0.001* | 25.776 | <0.001* |
| 2018 | 128 | 1-3 | 1.510±0.877 | 7.611 | <0.001* | 25.672 | <0.001* |
| 2019 | 126 | 1-2 | 1.475±0.755 | 9.292 | <0.001* | 30.107 | <0.001* |
| ANOVA | F | 5.155 | | | | | |
| | P-value | 0.001* | | | | | |

Table 4 show all the final model is affect by Length of stay and a significant relation between year and International benchmark test value=3.5 were P-value=0.001The mean and standard aviation of length of stay (in days) is plotted in table 5. The mean of LOS of all years was 1.087±0.98 days with range of (1-5) days. There was statistically significant difference were F=5.155, P-value=0.001 in mean of LOS across all years (<0.05). Length of stay is declined from 6 days maximum to 1 days with statistically significant difference across all years with international benchmark (<0.05) as seen in table 1. Interestingly, this table showed that LOS is started to become shortened than national benchmark from 2017 and above.

Figure 2: LOS in our institute versus national and international benchmark



In figure 2, the length of stay in our institute was statistically and graphically shorter than national benchmark to reach 15 hour shorter in 2019. International benchmark is doubled the duration at last year

Table (5) Describe of the Multivariate regression analysis for determinants of LOS.

| Table 5: Multivariate regression analysis for determinants of LOS. | | | | | | | | |
|--------------------------------------------------------------------|-----------------------------|-------|---------------------------|--------|---------|--------|---------|----------------|
| Dependent Variable: Length of Stay (day) | Unstandardized Coefficients | | Standardized Coefficients | T-test | | ANOVA | | R ² |
| | B | SE | Beta | t | P-value | F | P-value | |
| (Constant) | -26.176 | 8.924 | | -2.933 | 0.006* | | | |
| PH | 2.640 | 1.244 | 0.186 | 2.122 | 0.042* | | | |
| Age at Admission | 0.027 | 0.030 | 0.118 | 0.894 | 0.378 | | | |
| AG | 0.119 | 0.037 | 0.376 | 3.251 | 0.003* | | | |
| HCO3 | 0.389 | 0.126 | 0.588 | 3.089 | 0.004* | | | |
| BS | 0.030 | 0.024 | 0.203 | 1.257 | 0.218 | 14.539 | 0.000 | 74.80% |
| ICU STAY LENGTH | 0.433 | 0.371 | 0.205 | 1.167 | 0.252 | | | |
| Resorption of DKA Normalization of AG/hours | 0.067 | 0.019 | 0.695 | 3.502 | 0.001* | | | |
| TSH | -0.049 | 0.13 | -0.070 | - | 0.711 | | | |

| | | | | | | | |
|-----|-----------|-------|-------|-------|-------|--|--|
| | | 1 | | 0.374 | | | |
| FT4 | 9.710E-02 | 0.131 | 0.168 | 0.742 | 0.464 | | |

Table 5 show Multivariate regression analysis was done to determine the prognostic factors for lengthy stay. It has been found that presence of ketoacidosis, anion gap, change in bicarbonate level and resorption of DKA in hours are statistically significant and regarded as determinants of LOS in DM patients. Also the Multivariate regression analysis for determinants of LOS by R² (74.80%) no significant relation between Unstandardized Coefficients and Standardized Coefficients and dependent variables Length of Stay (day) were F (14.539)and P-value=0.000.

Table (6) Describe of the Complications

| Table 6: Complication | | | | | | | | | |
|-----------------------|-------------|--------------|-------|----------|-------|-------|-------|----------------|---------|
| | | Complication | | | | | | Chi-square | |
| | | Negative | | Positive | | Total | | X ² | P-value |
| | | N | % | N | % | N | % | | |
| BMI | Underweight | 77 | 15.0% | 28 | 43.8% | 105 | 18.2% | 35.351 | <0.001* |
| | Normal | 260 | 50.8% | 12 | 18.8% | 272 | 47.2% | | |
| | Overweight | 73 | 14.3% | 9 | 14.1% | 82 | 14.2% | | |
| | Obese | 102 | 19.9% | 15 | 23.4% | 117 | 20.3% | | |
| GAD ABS | Negative | 19 | 9.8% | 6 | 37.5% | 25 | 11.9% | 7.774 | 0.005* |
| | Positive | 175 | 90.2% | 10 | 62.5% | 185 | 88.1% | | |
| ICA | Negative | 74 | 42.3% | 9 | 69.2% | 83 | 44.1% | 3.576 | 0.059 |
| | Positive | 101 | 57.7% | 4 | 30.8% | 105 | 55.9% | | |
| IAA | Negative | 63 | 36.4% | 12 | 85.7% | 75 | 40.1% | 13.486 | <0.001* |
| | Positive | 110 | 63.6% | 2 | 14.3% | 112 | 59.9% | | |
| HYPO THYR OIDIS M | Negative | 413 | 80.7% | 55 | 85.9% | 468 | 81.3% | 1.106 | 0.293 |
| | Positive | 99 | 19.3% | 9 | 14.1% | 108 | 18.8% | | |
| ICU | No | 484 | 94.5% | 50 | 78.1% | 534 | 92.7% | 16.38 | <0.001 |

| | | | | | | | | | |
|------------|-----|----|------|----|-------|----|------|---|---|
| /Admission | | | | | | | % | 5 | * |
| | Yes | 28 | 5.5% | 14 | 21.9% | 42 | 7.3% | | |

Table 6 show Complications the number of serious complications was found in 64 patients (11.11%). In table 8, study variables were studied against presence of complications. The complications are highly associated with BMI, GAD ABS, immunoglobulin autoantibodies (IAA) and ICU admission with high significant difference ($p < 0.05$). Only six cases died after admission with DKA

DISCUSSION

In our study, the length of stay was associated with severity of condition, ICU admission and resolution of DKA per hours. Our mean LOS was statistically significant shorter than that of international mean throughout all years of comparison. However, national mean of LOS was found to be longer than ours in the last years (2021). In our study, only six cases died after admission with DKA. They were of type II DM. the low mortality rate might be explained by several reasons; enhanced patients' education with daily glucose monitoring, increased awareness about DM and its sequel[38], and finally, improved dietary and health programs for diabetic patients[39] All these causes might explain the decline of DKA development in our environment. Finally they were removed from data analysis.

Decrease in DKA hospitalization is a worldwide finding. Another study reported an increase in ED visit for DM since 1995 with concomitant decrease in diagnosis of DKA since 1980. Indeed, DKA severity is highly dependent on the severity of coexisting disease and missing insulin therapy. So, presence of severe infection with uncontrollable blood serum sugar level might increase the probability of death[40]. This was shortest than libyan study (7.7 days)[4], USA (3.6 days)[29] and Jordan (3.4 days)[32]

Longer hospital stay means unnecessary addition of costs during DKA management. Mild case of DKA may need few hours in ED with later on discharge. However, severe DKA cases need immediate admission to ICU for rapid management of biochemical derangement. The most important indication for ICU admission is presence of concomitant infection not only the biochemical profile of the cases .

The number of serious complications was found in 64 patients (11.11%). Our rate of complications is much lower than that seen in many middle east countries[41] This rate indicate powerful skills of medical and nursing staff for detecting and managing sequelae as well as higher recruitment of advanced diagnostic and therapeutic facilities in our institute .

In conclusion, decrease length of diabetic Center in emergency room of Diabetic center Al-Noor Hospital in Makkah Al-Mokarramah, stay is highly dependent on severity of condition, metabolic derangement and presence of co-existing diseases.

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