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Hyperglycaemia and inpatient mortality and morbidity

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Table 1. Continuous variables significantly related with mortality at 1 year (analysed using Mann–Whitney *U* test)

	Mortality, yes, median (IQR)	Mortality, no, median (IQR)	p-value
Age on admission, years	80.0 (71.0–86.0)	69.0 (49.0–80.0)	<0.001
Length of stay in hospital, days	6.0 (3.0–13.0)	3.0 (2.0–6.0)	<0.001
Plasma glucose on admission, mmol/L	7.0 (5.8–9.8)	6.4 (5.5–8.43)	0.005
Serum creatinine, µmol/L	94.0 (70–142.8)	81.0 (65–105.5)	<0.001
Serum urea, mmol/L	9.2 (6.7–14.9)	6.5 (4.8–9.3)	<0.001
Estimated GFR, mL/min/1.73m^2	60.0 (36.0–88.5)	80.0 (56.5–103.0)	<0.001
Serum sodium, mmol/L	138.0 (135.0–140.0)	139.0 (136.0–141.0)	0.005
Serum chloride, mmol/L	98.0 (94.2–101.6)	100.2 (97.1–102.6)	<0.001
Serum osmolality, mOsm/kg	302.2 (294.6–314.0)	300.8 (295.0–307.0)	0.020

GFR = glomerular filtration rate; IQR = interquartile range.

Introduction

Hyperglycaemia is frequent among hospital patients and is related to increased complications, poorer outcomes and increased mortality.[1,2] We examined the relationship between hyperglycaemia on admission with morbidity and mortality. By reviewing hospital admissions during different seasons, we studied seasonal variation in the relationship of hyperglycaemia to mortality in view of the known seasonal variation in blood glucose levels.[3,4]

Material and methods

We retrospectively examined the records of 1,132 hospital admissions. Hyperglycaemia was defined as an admission random glucose level of above 11.0 mmol/L. For statistical analyses, we used the Mann–Whitney *U* test, complemented by Spearman's rank correlation and chi-squared tests with a significance level of p=0.05.

Results and discussion

Hyperglycaemia was present in 14.1% of patients admitted to the hospital, of whom, 3.9% had no previously documented history of diabetes. Patients with new-onset hyperglycaemia on admission, had a significantly higher mortality rate than previously diagnosed diabetes (43.3% vs 17.9%; p=0.006). Logistic regression showed that plasma glucose on admission was independently associated with increased 1-year mortality (odds ratio 1.035; p=0.034). Table 1 shows the continuous variables significantly related with mortality at 1 year, while Table 2 shows the relationship of diabetes history and of plasma glucose on admission related with mortality and re-hospitalisation at 1 year.

Hyperglycaemia at admission was also an independent predictor of increased length of stay (p≤0.001). A longer inpatient course was associated with an increased 90-day and 1-year mortality (p<0.001 for both). After adjusting for confounding variables, admission plasma glucose and length of stay remained significant predictors of 1-year mortality outcome (p=0.034 and p=0.003, respectively). In April 2019, a higher 90-day and 1-year mortality rate were noted (p=0.001 and p=0.015, respectively), together with a higher proportion of patients admitted with new-onset hyperglycaemia (p=0.012). In January 2019, more previously known patients with diabetes were admitted with hyperglycaemia (p=0.012). Younger patients were more likely to be admitted in the summer. When comparing mortality at 90 days and 1 year, April 2019 had a higher mortality rate than expected (p=0.001 and p=0.015, respectively). Interestingly, this was not observed in April 2020.

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Table 2. Diabetes history and blood glucose on admission related with mortality and re-hospitalisation at 1 year

Plasma glucose on admission	Mortality, n (%)	p-value	Re-hospitalised, n (%)	p-value
Patient with known diabetes				
<11 mmol/L	36 (22.8)	0.006	90 (57.0)	0.003
>11 mmol/L	14 (17.9)	0.006	44 (56.4)	0.003
Patient not known to have diabetes				
<11 mmol/L	90 (18.1)	0.006	217 (43.6)	0.003
>11 mmol/L	13 (43.3)	0.006	10 (33.3)	0.003

Conclusion

Our results indicate that plasma glucose is an important prognostic marker and may indicate a more severe illness. We recommend that these patients are highlighted with a greater level of care. A glycosylated haemoglobin level taken at admission in cases of new-onset hyperglycaemia can aid differentiation between stress hyperglycaemia and undiagnosed diabetes. ■

References

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