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# Assessment of Nurses' Knowledge and Practices on Management of Hypoglycemia in hospital Diabetes Patients at Somine Dolo Hospital in Mopti

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**Abstract** **Original Research Article**

Diabetes is one of the fastest-growing global health challenges of the 21st century and hypoglycemia is a common complication It is associated with a poor short or long-term prognosis. Nurses, the backbone of healthcare services, play a crucial role in managing hypoglycaemia in hospitalised patients. That is why we initiated this study, the aim of which was to assess nurses' knowledge and practices regarding the management of hypoglycaemia in hospitalised patients living with diabetes. This was a cross-sectional study conducted at the Sominé DOLO Hospital in Mopti. It consisted of a self-administering questionnaire for nurses working in departments receiving patients living with diabetes. We achieved a participation rate of 89,5%. Men accounted for 56,9% of participants, with a sex ratio of 1,3. In 51% and 49% of cases, nurses held a bachelor's nursing degree and a secondary nursing school degree, respectively. The median length of professional experience was 6 years [IQR = 4, 11 years], and 62,7% had never received training on diabetes since completing their nursing studies. We found weak, average and good levels of knowledge regarding the diagnosis of hypoglycaemia in 13,7%, 39,2% and 47,1% of cases, respectively. Knowledge levels regarding the treatment of hypoglycaemia were weak in 9,8% of cases, average in 23,5% of cases and good in 66,7% of cases. There was a statistically significant link between good knowledge of hypoglycaemia treatment and being male [p = 0,001] and having a bachelor's degree in nursing [p = 0,029]. A statistically significant correlation between the diagnosis score and the therapeutic score was also observed [p = 0,003]. We found that the majority of our nurses have a good knowledge of how to manage hypoglycaemia in hospitalised patients living with diabetes. However, it appears that those with lower levels of education and those with longer professional experience need regular update.

**Keywords:** Hypoglycaemia – Nurses – Sominé DOLO Hospital in Mopti – Mali.



## INTRODUCTION

Diabetes mellitus is a group of metabolic disorders of carbohydrate metabolism in which glucose is both underutilized as an energy source and overproduced due to inappropriate gluconeogenesis and glycogenolysis, resulting in hyperglycemia [1]. According to International Diabetes Federation [IDF], diabetes is one of the fastest-growing global health challenges of the 21st century. In 2024, it is estimated that 589 million adults aged 20-79 were living with diabetes and the total number of people living with diabetes is projected to reach 853 million by 2050 [2]. In the United States, in 2010, patients with a diagnosis of diabetes discharged from hospitals represented 21,3% of all discharged patients [3]. In Mali, a study revealed that 8,84% of hospitalised patients were living with diabetes [4].

Hypoglycemia is a common complication of diabetes and is one of the important obstacles to achieving glycemic control in diabetes patients [5]. Some autors reported that 25 % to 32 % of patients living with diabetes may experience hypoglycemia during a hospital admission [3,6]. In Mali, we have already reported that hypoglycaemia was the most frequently observed adverse effect in hospitalised patients [7]. Many factors may contribute to development of hypoglycemia in admitted patients, including poor

nutrition, low body weight, longer duration of diabetes, renal failure, heart failure, advanced liver disease, diabetic autonomic neuropathy, inadequate self-management ability and diabetes knowledge, advance age, and infections [5,8–10]. Also, intensive treatment of hyperglycaemia with insulin to ensure the best possible glycaemic control in hospitalised patients living with diabetes, as recommended, increases the risk of hypoglycaemia [11,12]. It has been shown that in hospitalized patients, hypoglycemia, either with insulin use or spontaneous, is associated with increased short and long-term mortality [13]. Also, studies reported that hypoglycemia was associated with increased length of stay, falls, need for intensive care unit admission, risk for hospital readmissions and hospital mortality [14–17]. Hypoglycemia can be symptomatic or asymptomatic and bedside capillary glucose testing is recommended as the preferred method for glucose monitoring and for guiding glycemic management of patients in non- intensive care unit settings. It's usually performed before meals and at bedtime for patients who are eating or every 4–6 hours for patients who are not eating or receiving continuous enteral nutrition [14]. Thus, nurses play a critical front-line role in recognising and managing hypoglycaemia. Unfortunately, several international studies have documented persistent gaps in nurses' ability to respond to this event [18].

To our knowledge, there are no studies in Mali that have assessed nurses' knowledge and practices regarding hypoglycaemia. We therefore initiated this study, the objective of which was to assess nurses' knowledge and practices in the management of hypoglycaemia in patients living with diabetes hospitalised at the Sominé DOLO Hospital in Mopti.

## METHODOLOGY

This was a cross-sectional study conducted in December 2024 at the Sominé DOLO Hospital in Mopti, a secondary referral hospital that receives patients from the region's eight health districts. It consisted of a self-administering questionnaire for nurses working in departments receiving patients living with diabetes, namely medicine, surgery, intensive care, emergency, paediatric and gynaecology-obstetrics departments. In January 2021, we developed a protocol for managing hypoglycaemia in hospitalised patients living with diabetes, which we implemented in these various departments. This protocol included clinical signs, biological threshold [<0,70 g/l], causes, treatment, monitoring, prevention of hypoglycaemia and continuation of antidiabetic treatment after an episode of hypoglycaemia [do not omit insulin, suspend oral antidiabetic drugs].

**The questionnaire consisted of four sections:**

- Sociodemographic data: age, gender, level of education [Graduate of a secondary nursing school or holder of a bachelor's degree in nursing], work experience, department, training received on diabetes since completing nursing studies ;
- Diagnostic of hypoglycaemia [multiple choice questions]: clinical signs, biological threshold, causes of hypoglycaemia;
- Hypoglycaemia treatment [multiple-choice questions]: type of carbohydrate used to correct hypoglycaemia, amount of carbohydrate to be administered, monitoring, prevention of further episodes of hypoglycaemia;
- Treatment of diabetes after an episode of hypoglycaemia [true or false]: administration of insulin scheduled for the meal following the episode of hypoglycaemia, postprandial hyperglycaemia observed if insulin is not administered.
- Based on the answers obtained in the sections devoted to the diagnosis and treatment of hypoglycaemia, we calculated a diagnosis score and a hypoglycaemia treatment score as follows:
- Diagnosis score [3 questions]: 0 to 1 correct answer = knowledge considered weak, 2 correct answers = knowledge considered average, 3 correct answers = knowledge considered good;
- Therapeutic score [4 questions]: 0 to 1 correct answer = knowledge considered weak, 2 correct answers = knowledge considered average, 3 to 4 correct answers = knowledge considered good.

The data were entered into Excel 2013 and processed using IBM SPSS Statistics 26 software. Due to the small sample size, we used Fischer's exact test to investigate a possible link between diagnosis and therapeutic scores on the one hand and other variables on the other, with a statistical significance threshold set at $p < 0,05$.

## RESULTS

Of the 57 nurses contacted, 51 agreed to respond to our survey, representing a participation rate of 89,47%. The median age was 32 years with an interquartile range [IQR] of [IQR=30, 38 years]. In 58,8% of cases, participants were aged between 30 and 40 years. Participants were male in 56,9% of cases, with a sex ratio of 1,3. There were 26 nurses holdering of a bachelor's degree in nursing and 25 nurses graduated of a secondary nursing school, representing 51% and 49% respectively. The median length of professional experience was 6 years [IQR = 4, 11 years], and 62,7% had never received training on diabetes since completing their nursing studies. The nurses worked in medecine, surgery, intensive care, emergency, paediatric, and gynaecology – obstetrics departments in 21,6%, 19,6%, 7,8%, 19,6%, 19,6%, and 11,8% of cases, respectively.

In 94,1% of cases, nurses recognised the clinical signs of hypoglycaemia. The biological threshold for hypoglycaemia was recognised by 47,1% of participants. The causes of hypoglycaemia were known by 90,2% of participants. This resulted in 13,7%, 39,2% and 47,1% of participants being classified as having weak, average and good levels of diagnosis knowledge, respectively. Nurses recognised that hypoglycaemia is corrected with fast-acting carbohydrates in 58,8% of cases and in 27,5% of cases, they recognised the amount of carbohydrate to be administered. In 96,1% of cases, participants recognised the need to monitor blood glucose levels during treatment, and in 90,2% of cases, they stated that they would prevent further episodes of hypoglycaemia based on the cause of the hypoglycaemia found. Overall, we observed that knowledge of hypoglycaemia treatment was weak in 9,8% of cases, average in 23,5% of cases, and good in 66,7% of cases.

If hypoglycaemia occurs just before a meal, 47,1% of nurses said they would omit the insulin dose planned for that meal for fear of another episode of hypoglycaemia. Among them, 41,7% said they had observed hyperglycaemia after the meal if insulin was not administered. In 68,6% of cases, nurses stated that they did not have a protocol for managing hypoglycaemia in their department.

From an analytical perspective, we observed no statistically significant correlation between diagnostic scores and other variables. However, we noted that participants with good diagnostic knowledge tended to be male, younger, less experienced, more educated, and had completed at least one diabetes training course since completing their nursing studies **[Table I]**. A statistically significant link was noted between good knowledge of hypoglycaemia treatment and male gender [p=0,001] as well as bachelor's degree in nursing [p=0,029]. We also observed a statistically significant correlation between the diagnostic score and the therapeutic score [p=0.003].

**Table I: Correlation between diagnostic scores and other variables**

| Variables | Good diagnosis knowledge | | p value |
|---|---|---|---|
| | Yes | No | |
| **Age group [years]** | | | **0,682** |
| < 30 | 7 | 5 | |
| [30-40] | 13 | 17 | |
| > 40 | 4 | 5 | |
| **Sex** | | | **0,147** |
| Male | 16 | 13 | |
| Female | 8 | 14 | |
| **Education level** | | | **0,441** |
| Bachelor’s degree in nursing | 13 | 13 | |
| Secondary nursing school degree | 11 | 14 | |
| **Work experience [Years]** | | | **0,480** |
| < 5 | 8 | 5 | |
| [5-10] | 10 | 15 | |
| > 10 | 6 | 7 | |
| **Training received on diabetes since completing nursing studies** | | | **0,373** |
| Yes | 10 | 9 | |
| No | 14 | 18 | |

## DISCUSSION

This study evaluated the knowledge and practices of nurses at Sominé DOLO hospital in Mopti regarding hypoglycemia management in hospitalised patients living with diabetes. We recorded a participation rate of 89,47%.

In socio-demographic terms, the median age was 32 years [IQR = 30, 38 years]. The [30-40 years] age group was the most represented with 58,8%. Men accounted for 56,9% of our workforce, with a sex ratio of 1,3. Participants were almost equally divided between nurses who hold a bachelor's degree in nursing and nurses who had graduated from a secondary nursing school, at 51% and 49% respectively. The median length of work experience for nurses was 6 years [IQR= 4, 11 years] and in 62,7% of cases, nurses reported that they had received no training on diabetes since completing their nursing studies. They worked in all departments caring for patients living with diabetes, namely medicine, surgery, intensive care, emergency, paediatrics and obstetrics/gynaecology, in 21,6%, 19,6%, 7,8%, 19,6%, 19,6% and 11,8% of cases, respectively. Altahan *et al.,* [19] in Iraq also reported a male predominance of 61,1%, with the modal age group being 30 to 39 years old. On the other hand, nurses who had graduated from secondary nursing schools were the most represented, accounting for 44%. Isnani *et al.,* [20]

in Philippines observed a women predominance of 76,7% and an average age of 29, ranging from 22 to 58. In 80,7% of cases, participants held a bachelor's degree in nursing. Only 22,7% had received training in the management of hypoglycaemia and the mean work experience was 5 years ranging from 1 to 37 years, which are close to our results. Al-Bawi *et al.,* [21] in Iran noted a predominance of women, accounting for 55,8% of the sample, with a modal age group of 20-29 years. Graduates of secondary nursing schools were the most numerous, accounting for 41,3% of the sample. The majority of participants worked in internal medicine and emergency departments, accounting for 23,3% and 21,5% of cases, respectively. In 62,8% of cases, participants had less than 5 years of work experience. Majic *et al.,* [18] in Croatia also observed a strong female predominance, at 80,8%. The 26-35 age group was the most common. The majority of participants, 45,7%, held a bachelor's degree in nursing. More than half of the participants [56,8%] had over 10 years' work experience.

The first step in managing hypoglycaemia in hospitalised patients living with diabetes is to suspect it based on clinical signs and confirm it with a bedside glucose test. The second step is to raise blood glucose levels using fast-acting carbohydrates, monitor blood glucose levels to ensure they return to normal, and finally, prevent further episodes of hypoglycaemia through awareness. Our participants had a good knowledge of the clinical signs and causes of hypoglycaemia, with 94,1% and 90,2% of cases respectively. However, only 47,1% of them recognised the biological threshold for hypoglycaemia. This enabled us to obtain a diagnostic score with a weak, average and good level of knowledge in 13,7%, 39,2% and 47,1% of cases respectively. In England, while Mandal *et al.,* [22] showed that only 28% and 58% of nurses recognised the clinical signs and biological threshold of hypoglycaemia, respectively, Ndebu *et al.,* [23] reported that up to 93,75% of participants recognised the clinical signs of hypoglycaemia and that in 90% of cases, nurses recognised the biological threshold for hypoglycaemia. Altahan *et al.,* [19] observed that nurses' levels of knowledge were average and low, respectively, regarding the clinical signs and causes of hypoglycaemia. According to Isnani *et al.,* [20], regarding knowledge of hypoglycaemia, 62,8% of participants reached the computed minimum pass level of 70%. Al-bawi *et al.,* [21] noted a good knowledge of the definition and epidemiology of diabetes among 57% of nurses, knowledge was considered average and poor in 36% and 7% of cases, respectively. Regarding causes and risk factors, 51,2% of nurses had poor knowledge, 48,3% had average knowledge, and only 0,6% had good knowledge. In our study, nurses did not have sufficient knowledge of the type and the amount of carbohydrate to administer during hypoglycaemia treatment. Thus, 58,8% of nurses used fast-acting carbohydrates and only 27,5% of participants knew the amount of sugar to administer. On the other hand, blood glucose monitoring during treatment and the prevention of further episodes of hypoglycaemia were common practices, carried out by 96,1% and 90,2% of nurses respectively. This gave us the following therapeutic ratings: weak in 9,8% of cases, medium in 23,5% of cases, and good in 66,7% of cases. Mandal *et al.,* [22] reported in their study that 73% of participants responded that they would use a form of fast-acting carbohydrates. Only 33% would recheck capillary blood glucose within 15 minutes, while 28% did not know when to recheck. At least 57% did not feel the need to measure venous blood glucose during a hypoglycaemic episode. Ndebu *et al.,* [23] observed that everyone used some form of rapid-acting carbohydrates for hypoglycaemia treatment and only 77,5% of the nursing staff rechecked the capillary blood glucose according to hospital's guidelines. Isnani *et al.,* [20] noted that the majority of respondents had correct practices in 5/9 practice points. Al-Bawi *et al.,* [21] observed that in terms of nursing care and treatment, nurses' knowledge of hypoglycaemia in diabetic patients was poor in 19,2%, moderate in 70,3% and good in 10,5%. In terms of protection and prevention, nurses' knowledge was poor in 40,1%, average in 40,7% and good in 19.2%. In their study, Majic *et al.,* [18] noted that the participants showed generally positive attitudes toward hypoglycemia management.

In our study, 47,1% of nurses do not administer insulin after treating hypoglycaemia for fear of another episode of hypoglycaemia, although 41,7% of them reported observing a hyperglycaemic rebound when insulin was not administered. Mandal *et al.,* [22] noted that omitting insulin after treating a hypoglycaemic episode is a common problem and that 66% of nurses felt that they would omit and should omit insulin after treating a hypoglycaemic episode. And among the nurses surveyed, 76% believed that hypoglycaemia increased mortality rates. Ndebu *et al.,* [23] rapported that 10% of participants stated that they would have omitted insulin after treating hypoglycaemia.

We found that in 68,6% of cases, nurses reported not having a protocol for managing hypoglycaemia in their department, even though this protocol had been put in place in January 2021. In contrast Mandal *et al.,* [22] rapported that 77% of the participating nurses were aware of the hospital's new guidelines for managing hypoglycaemia. This significant difference could be explained, on the one hand, by the fact that over time, the protocol displayed in the treatment rooms was lost and not replaced, and on the other hand, by the fact that newcomers were not informed of the protocol's existence.

We observed no statistically significant link between the other variables and the diagnosis scores. However, participants with good diagnosis knowledge tended to be male, younger, holders of a bachelor's

degree in nursing, less experienced, and to have completed at least one training course on diabetes after obtaining their nursing degree. On the other hand, we noted a statistically significant link between good knowledge of hypoglycaemia treatment and being male [p=0,001] and holding a bachelor's degree in nursing [p=0,029]. Majic *et al.,* [18] showed that nurses with tertiary education scored significantly higher on knowledge and on attitude compared to nurses with secondary education. When comparing by experience [≤5 years vs. >5 years], nurses with more experience had significantly higher knowledge scores, but their attitudes did not differ significantly. Also, in the multivariable analysis, tertiary education was the strongest independent predictor of sufficient knowledge, female sex was associated with higher odds of adequate knowledge, while experience and workplace type were not statistically significant predictors, in the logistic regression model. In the linear regression model of attitudes, tertiary education remained a strong predictor of more favorable attitudes, while sex, experience, and workplace showed small or borderline effects. In light of the above, it appears that nurses' level of education is the key factor determining their skills in managing hypoglycaemia. Our study also showed a statistically significant positive correlation between the diagnosis score and the therapeutic score [p=0,003]. Altahan *et al.,* [19] also rapported that there are significant correlation between nurses' knowledge scale and attitude scale. This suggests that better diagnostic knowledge leads to better care.

## CONCLUSION

At the end of this study, it appears that in the majority of cases, our nurses generally have good knowledge about the management of hypoglycemia in hospitalized patients living with diabetes. However, gaps were observed specifically in the biological threshold for hypoglycemia and in the amount of fast-acting carbohydrates to be administered. Also, it was found that nurses with less knowledge tended to be less educated, with longer work experience, and had not received training on diabetes since completing their nursing studies. We therefore organized training on the management of hypoglycemia in patients living with diabetes intended for all hospital medical staff with the aim of improving the quality of care, which will have to be evaluated in a future study.

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