# Profile Of Type 2 Diabetes Mellitus Patients With Hypoglycemia Events In RSUD Dr. Soetomo Hospital, Surabaya from January 2019 - March 2021

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# Profile of Type 2 Diabetes Mellitus Patients with Hypoglycemia Events in RSUD Dr. Soetomo Hospital, Surabaya from January 2019 - March 2021

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## Abstract

**Background:** Hypoglycemia is a decrease in blood glucose levels which is the most common side effect of diabetes mellitus due to its treatment and is rarely a concern for patients and health workers. However, because the patient neglects the mild hypoglycemia symptoms, they cannot be immediately identified and treated. Each Type 2 diabetes mellitus (T2DM) patient with hypoglycemia has a different profile and manifestations.
**Objective:** This study aims to identify the demography, clinical, and laboratory profiles of T2DM patients who experience hypoglycemia in the inpatient unit of RSUD Dr. Soetomo Hospital Surabaya from January 2019 - March 2021. **Material and method:** This study is a retrospective descriptive study. Medical record data were collected through totalsampling, then processed descriptively, and presented as a frequency distribution table.
**Results:** The samples of this study were 83 T2DM patients with hypoglycemia. The most age group was > 65 years, with 33 (39.8%) patients. The most gender group was female in 55 (66.3%) patients, the most common chief complaint was decreased consciousness in 47 (56.6%) patients, and the most common results of head physical examination were anemic conjunctiva in 43 (51.8%) patients. Extremity examination results 13 (15.7%) patients had wounds, and 10 (12.0%) patients had edema. The results of the random plasma glucose (RPG) examination <40 mg/dl in 62 (74.7%) patients, low Hb in 66 (79.5%) patients, high leukocytes in 47 (56.6%) patients, and high BUN in 52 (62.7%) patients. SK was high in 42 (50.6%) patients, and albumin was low in 56 (67.5%) patients.
**Conclusion:** From this study, T2DM patients with hypoglycemia events were highly female and primarily found in patients over 65 years with severe hypoglycemia. The most common chief complaint was decreased consciousness, and the most common laboratory result was anemia, leukocytosis, high BUN, high SK, and hypoalbuminemia.

Keywords : Clinical profile; Laboratory profile; Type 2 diabetes mellitus; Hypoglycemia

## 1. Introduction

Diabetes Mellitus (DM) is a chronic metabolic disease that can be characterized by increased blood glucose levels (hyperglycemia) due to impaired insulin secretion, insulin action, or both (1). According to WHO data in 2019, an estimated 1.5 million deaths were caused directly by diabetes. The disease prevalence is increasing faster in low- and middle-income countries compared to high-income countries (2). DM is classified into two types: type 1 DM (T1DM), characterized by low insulin production and requires daily insulin administration, and type 2 DM (T2DM), caused by the body's ineffective use of insulin. Most people with DM suffer from T2DM, accounting for about 90% of all cases of diabetes (3).

The incidence of hypoglycemia is the most common side effect of DM from treating the disease itself, such as DM drugs and insulin (4). Hypoglycemia is a condition with a low blood glucose level of less than 70

mg/dL. If blood glucose is allowed to stay low for too long, the brain will lack glucose, leading to coma, seizures, and death (5). The number of patients with hypoglycemia in DM in Indonesia is 1.1% nationally and 5.7% among urban residents in Indonesia (6).

In general, the body's response to hypoglycemia events will suppress insulin secretion, increase glucagon secretion from the pancreas, increase epinephrine from the adrenal medulla, increase norepinephrine from postganglionic sympathetic nerves, increase cortisol from the adrenal cortex, and increase growth hormone from the anterior pituitary (7). Severe hypoglycemia causes selective neuronal death and cognitive impairment. Oxidative stress is also implicated in hypoglycemic nerve injury, leading to nerve damage and failure due to severe hypoglycemia exacerbated by diabetes because of the glucose substrate (8). The main cause of hypoglycemia in patients with T2DM is iatrogenic, which occurs due to the choice of therapy with insulin and oral drugs that trigger pancreatic insulin secretion (9). Giving these drugs causes the failure of the CRR system to rebalance blood glucose levels so that they are not too low (10).

T2DM patients can get hypoglycemia caused by the therapy of the T2DM itself, which, if blood glucose levels are not evaluated and observed regularly, can worsen the patient's condition so that he becomes a coma which can lead to death. Therefore, tracing the data from the results of demography, clinical, and laboratory examinations of patients can help detect the characteristics of T2DM patients who have a tendency towards the incidence of hypoglycemia.

## 2. MATERIAL AND METHOD

This study is a retrospective descriptive study, with secondary data from medical records of T2DM inpatients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya in the period January 2019 – March 2021. Data taken from medical records include patients' baseline data, clinical examinations, laboratory examinations, and medical history. Data was taken from medical records, recorded for entry, and processed using Microsoft Excel. The data was presented in the form of a frequency distribution table. The sample of this study was all T2DM inpatients who experienced hypoglycemia. Samples were taken using the total sampling technique.

## 3. RESULTS

The secondary data taken from medical records with the sample of this study were all T2DM inpatients who experienced hypoglycemia from January 2019 – March 2021. There were 83 samples of T2DM inpatients with hypoglycemia in RSUD Dr. Soetomo Hospital, Surabaya. The samples were taken based on the clinical symptoms, physical examination, and the result of laboratory examinations.

Table 1. Gender and age distribution in T2DM Patients with Hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya, January 2019 – March 2021

| Demographic characteristic | Frequency | Percentage (%) |
|---|---|---|
| Sex | | |
| Female | 55 | 66,3 |
| Male | 28 | 33,7 |
| Age | | |
| > 65 years | 33 | 39,8 |
| 56-65 years | 31 | 37,3 |
| 46-55 years | 15 | 18,1 |
| 36-45 years | 3 | 3,6 |
| 26-35 years | 1 | 1,2 |

Table 1 depicts the distribution of sex and age group of T2DM patients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya in the period January 2019 – March 2021, with age division according to the official website of the Indonesian Ministry of Health (2009). The highest number of age groups was > 65 years in 33 (39.8%) patients, and the most common sex was female in 55 (66.3%) patients.

Table 2. Chief Complaint in T2DM Patients with Hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya, January 2019 – March 2021

| Chief complaint | Frequency | Percentage (%) |
|---|---|---|
| Decreased consciousness | 47 | 56,6 |
| Weakness | 17 | 20,5 |
| Decreased appetite | 10 | 12,1 |
| Talking difficulty | 5 | 6,0 |
| Nauseous | 3 | 3,6 |
| Seizure | 1 | 1,2 |

Table 2 shows the distribution of the main complaints of T2DM patients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya from January 2019 – March 2021. Based on the history of the main complaint, the most common main complaint was decreased consciousness in 47 (56.6%) patients.

Table 3. Distribution of Clinical Manifestation Results in T2DM Patients with Hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya in January 2019 – March 2021

| Clinical manifestation | Frequency | Percentage (%) |
|---|---|---|
| Head and Face Examination | | |
| Anemic | 43 | 51,8 |
| Normal | 40 | 48,2 |
| Extremity Physical Examination | | |
| Normal | 54 | 65,1 |
| Wound | 13 | 15,7 |
| Edema | 10 | 12,0 |
| Acral Abnormality | 5 | 6,0 |
| Abscess | 1 | 1,2 |

Table 3 shows the distribution of the physical examination of T2DM patients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya from January 2019 – March 2021. The most abnormalities of the facial head examination were anemia in 43 (51.8%). Physical examination of the extremities with normal results was mainly found in 54 (65.1%) patients

Table 4. Distribution of RPG Results in T2DM Patients with Hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya in January 2019 – March2021

| Clinical manifestation | Frequency | Percentage (%) |
|---|---|---|
| <40 mg/dl (severe hypoglycemia) | 62 | 74.7 |
| 40 - 54 mg/dl (moderate hypoglycemia) | 11 | 13.3 |
| 55 - 70 mg/dl (mild hypoglycemia) | 5 | 6.0 |
| 71-100 mg/dL (normal) | 5 | 6.0 |

Table 4 shows the distribution of RPG results in T2DM patients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya from January 2019 – March 2021 based on categories by Rusdi. The most common result of RPG was < 40 mg/dl (severe hypoglycemia) in 62 (74.7%) patients.

Table 5. Distribution of Laboratory Results in T2DM Patients with Hypoglycemia in RSUD Dr. Soetomo Hospital Surabaya in January 2019 –March 2021

| Laboratory examination | Frequency | | | Percentage (%) | | |
|---|---|---|---|---|---|---|
| | Low | Normal | High | Low | Normal | High |
| Hb | 66 | 17 | 0 | 79,5 | 20,5 | 0 |
| Leukocyte | 1 | 35 | 47 | 1,2 | 42,2 | 56,6 |
| Platelets | 7 | 59 | 17 | 8,4 | 71,1 | 20,5 |
| Blood Urea Nitrogen | 1 | 30 | 52 | 1,2 | 36,1 | 62,7 |
| Serum Creatinine | 4 | 37 | 42 | 4,8 | 44,6 | 50,6 |
| AST / SGOT | 0 | 58 | 25 | 0 | 69,9 | 30,1 |
| ALT/ SGPT | 0 | 68 | 15 | 0 | 81,9 | 18,1 |
| Albumin | 56 | 27 | 0 | 67,5 | 32,5 | 0 |

Table 5 shows the distribution of results of the laboratory examinations of T2DM patients who experienced hypoglycemia in RSUD Dr. Soetomo Hospital. Surabaya in the period January 2019 – March 2021. Most of the patients had low Hb, namely 66 (79.5%) patients, high leukocytes in 47 (56.6%) patients, normal platelets in 59 (71.1%) patients, BUN and SK were high in 52 (62.7%) and 42 (50.6%) patients, AST and ALT were normal in 58 (69.9%) and 68 (81.9%) respectively, and low albumin in 56 (67.5%) patients.

## 4. Discussion

This study explained the demography, clinical, and laboratory profile. Based on the data collected through the medical record from RSUD Dr. Soetomo Hospital Surabaya hospital about the sex and age group of the patient based in table 1 showed that the age group of patients was mostly over 65 years, as many as 39.8%. This result is in line with a previous study that described patients over 65 years of age who failed to experience autonomic neuroglycopenic and hypoglycemic symptoms because they have a slow response or awareness of hypoglycemic events (11)(12). In this study, females had a higher prevalence of 66,3%, which was in line with previous studies where the most sex group prevalence was female patients with hypoglycemia in T2DM was 57.44% (13).

It was found that the most common main complaint was decreased consciousness with 56.6%, as stated in table 2. In Shriraam's 2017 study, slightly different results were found where weakness/tiredness, with 76.2%, was the most common symptom, while in this study, feeling weak and tired was the second most common complaint with 20.5%. However, there were some similarities with Shriraam's study in which seizures were a minor symptom that occurred to the patients (14). It is possible that in this study, decreased consciousness was caused by the severity of Hypoglycemia unawareness, where the body fails to identify hypoglycemic events (15).

Based on this study, the most common head and face examination results were anemia, as stated in table 2, which can be examined by looking at the patient's conjunctiva. The patient's anemic condition can occur due to T2DM disease. The presence of anemia in T2DM is usually associated with kidney failure to produce the appropriate erythropoietin (16). Erythropoietin is a hormone that increases erythrocyte production by maintaining red blood cell mass through the proliferation and differentiation of erythrocytic progenitors (17).

The prevalence of anemia in a 2014 study with 200 patients with T2DM showed a 63% incidence of anemia (18). However, for the association of the incidence of hypoglycemia in patients with T2DM to anemia, further research is needed. Meanwhile, for the extremities examination results, the majority showed normal results in 65,1% of patients based on table 3. Meanwhile, patients who had wounds were 15.7% of patients, and similarly, according to other studies, the prevalence of wounds in T2DM patients is 25%, indicating a fairly high prevalence (19).

Table 5 shows the patient's RPG level, which resulted in severe hypoglycemia (<40 mg/dl ) in 74,7% of patients. This result is similar to another study from India in a tertiary care hospital where the most common RPG level shown was severe hypoglycemia which was reported among 19% of patients (14), of which from the ADA guidelines severe hypoglycemia was Individuals who needed the help of others where unconsciousness could occur. Some patients come with normal GDA levels feel symptoms of hypoglycemia which can be estimated that the patient is experiencing false hypoglycemia. The incident can occur in people with newly diagnosed diabetes whose blood glucose was significantly above normal and is now lower also in people who are diagnosed with diabetes, with high blood glucose, who now have improved glucose control (20).

Research related to its frequency and prevalence in laboratory results is rarely studied. From the laboratory examination shown in table 6, low Hb is the most common result in T2DM patients with hypoglycemic events in 66 patients. Of the 66 patients with low Hb, 23 did not experience pale conjunctiva. According to one study, the presence of pallor can increase the likelihood of severe anemia, while the absence of pallor can rule out severe anemia. These findings suggest that at the 7 g/dL hemoglobin cut-off point, the absence of pale conjunctiva and tongue completely excludes the possibility of hemoglobin <7 g/dL (21). This study found high leukocyte levels in 56.6% of patients. This study's results align with Moradi's study, namely, the prevalence of high leukocytes in T2DM patients with hypoglycemia is around 52.2% of patients (22). Based on the results of this study, BUN and SK were high in 62.7% and 50.6% of patients, respectively. The results of BUN and SK in this study indicate a possibility of kidney disorders in most patients (23). In this study, 67.5% of patients had low blood albumin levels. Hypoalbuminemia can occur due to the underlying disease and the complications of T2DM suffered by the patient. According to another study, there are 80% of hypoalbuminemia in DM patients with hypoglycemia (24).

## 5. Conclusion

This study concludes that the most common main complaint is decreased consciousness, head and face examination is anemic, normal extremity physical examination, RPG results in severe hypoglycemia, laboratory examinations show results of anemia, leukocytosis, high BUN, high SK, and hypoalbuminemia.

## Acknowledgements

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