

# Evaluation of Diagnostic Specifications and Appropriateness of ICD Codes for Diabetes Mellitus Based on Age and Gender of Inpatients in Magelang City Hospital in 2023

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**Abstract**—Diabetes militus is classified into two types, namely type 1 and type 2, the disease ranks top as a non-communicable disease with a high number of sufferers. The determination of diagnoses and diagnosis codes must be precise so that the codes given by PMIK can be declared specific and appropriate, therefore it is necessary to review the provision of diagnosis codes on patients to determine the factors that cause non-specific and inappropriate codes based on age and gender and present the distribution of diabetes militus in Magelang City. The method used was descriptive qualitative by observing 144 medical record documents of patients with the main diagnosis of diabetes mellitus. The results showed that the specification of the main diagnosis of diabetes mellitus in Magelang City Hospital was 100%. The suitability of the main diagnosis code of diabetes mellitus based on the category can be concluded that the specific and appropriate code was found as much as 61%. While specific and inappropriate codes were found at 39%. The age of patients with diabetes is 23-90 years old, with the average age of patients being 59 years old. Patients with 56 years of age occupied the highest number of sufferers. Patients with female gender are more dominant in experiencing diabetes militus, when presented it reaches 63% while male patients are only 37%. The highest distribution of patients with diabetes mellitus in Magelang Hospital came from outside the city, namely Magelang District or 68%. Patients in Magelang city only reached 32%. Suggestions for further research would be better to consider taking the file period to avoid recording medical records during the media transfer period.

**Keywords**— Diabetes Militus, Code Conformity, Medical Record

## I. BACKGROUND

Medical records are defined as documents that record patient identity, examination, treatment, procedures and other services provided by hospitals or health care facilities to patients [1], [2]. Medical records in the eyes of the law serve to guarantee equality for patients and service providers [3]. Medical records are managed by medical and health information recorders (PMIK). In its implementation, the work of PMIK includes registration, assembling, coding, indexing, analyzing and reporting. Each part of the job has different duties and functions.

The role of coding officers according to the Decree of the Minister of Health of the Republic of Indonesia Number 377 / Menkes / SK / III / 2007 is to be able to determine the coding of diseases and medical actions in accordance with the classification of the International Statistical Classification of Diseases and Related Health Problems or ICD [4]. In a previous study, it was found that the incompatibility of hospital diagnosis codes with codes from BPJS was a factor that resulted in pending claims [5]. Ensuring that every disease and action has been coded in accordance with the ICD is an anticipation of reducing failed claims, especially in the case of diabetes mellitus. Code specifications will help categorize the disease according to its type according to the ICD, but in practice in the field the diagnosis code is not written properly [6].

Diabetes Mellitus is a disease that attacks a person's metabolism, even becoming a lifelong disease [7]. According to the Medical Dictionary, Diabetes Mellitus is a condition where the sugar content in the blood is very high, so that in the process of excretion through urine, glucose is excreted together. Cells that do not get glucose as they should experience decreased function [8]. Diabetes mellitus is a long-term disease whose cause stems from bad habits, but specifically in type II diabetes mellitus is influenced by heredity.

Diabetes Mellitus is a disease that was declared as the 100 Most Common Diseases in RITL 2018 according to JKN data (Kementrian Kesehatan Republik Indonesia, 2018). Based on observations made on October 27, 2023 at the Magelang City Hospital on 10 patient medical record documents, it shows that 90% of them use the E10.9 code while the other 10% make the E10.9 diagnosis code as a secondary diagnosis code. The use of code E10.9 (Type 1 diabetes mellitus without complication) or can be interpreted as type 1 diabetes mellitus without complications refers to the inaccuracy of the diagnosis code, due to the use of secondary diagnosis codes that refer to complications. In the 10 patient medical record documents,

secondary diagnoses of cerebra infection (20%), hypoglycemia (40%), infection in the urine (10%), malignant neoplasm colon (unspecified) or unspecified tumor (10%), while the rest had complications of hypertension as much as (20%).

Initial survey data related to hospitalized diabetes militus cases in 2022 showed that diabetes militus cases occurred in patients with an age range of 30-63 years. Female patients occupy the highest percentage of 60% while men are 40%. The distribution of patients with high percentage is patients who come from outside Magelang city 50%, North Magelang 20%, Central Magelang 20% and South Magelang 10%.

Based on the data obtained through the initial survey, according to the researcher, evaluating the coding of medical record documents of patients with diabetes mellitus by looking at the factors of age, gender and residence of patients is needed. Therefore, the study entitled "Evaluation of Diagnostic Specifications and Appropriateness of ICD Codes for Diabetes Mellitus Based on Age and Gender of Inpatients in Magelang City Hospital in 2023" can provide solutions and prevention of miscoding of disease diagnoses, especially in diabetes mellitus patients while knowing the distribution of diabetes in Magelang City.

## II. METHOD

Descriptive research was chosen by the researcher because it is in line with the research objectives, namely to provide an overview or description related to evaluation of the selection diagnostic specifications and the suitability of ICD codes for Diabetes Mellitus based on the age and gender of inpatients in Magelang City hospitals. Descriptive research is research to determine the description of a phenomenon that occurs in a particular population (...)

The data involved in this study are observation data, these data are categorized as qualitative data, so it can be concluded that this research is included in qualitative descriptive research. The data used is secondary data obtained through patient medical records totaling 144 medical record documents. The data was taken based on sample calculations using Morgan Krejcie Table by setting a time period limit, namely inpatient visits registered as old patients with the least number of visits three times and patients visiting in the period January-August 2023. Items for Systematic Reviews and Meta-analyses).

## III. RESULTS AND DISCUSSION

### Diagnostic Specifications for Diabetes Mellitus

In the context of establishing a primary diagnosis, specification is the selection of a disease diagnosis based on the cause of the greatest service to the patient. The choice of diagnosis should indicate the severity of the patient's illness, and be in line with the diagnosis of comorbidities or secondary diagnoses. In the specification of the main diagnosis of diabetes militus, the diagnosis is said to be specific if it represents the patient's type of diabetes. While non-specific is the main diagnosis in diabetes mellitus that does not indicate the patient has diabetes with insulin or without insulin. Based on the results of observations of 144 samples in the January-August 2023 time period, the following data were obtained regarding the main diagnosis specifications:

| Main Diagnosis Specifications | Total (Σ) | Percentage (%) |
|-------------------------------|-----------|----------------|
| 1. Specific                   | 144       | 100%           |
| 2. Unspecific                 | 0         | 0%             |

Based on the observation of 144 medical record documents, it shows that all documents are coded specifically (100%). The main diagnosis of diabetes militus is categorized as specific if it shows the type of diabetes experienced by the patient, namely type 1 diabetes militus with insulin and type 2 diabetes or without insulin.

| Main Diagnosis Written     | Specific | Unspecific | Percentage (%) |
|----------------------------|----------|------------|----------------|
| 1. Type 1 Diabetes Militus | 69       | 0          | 48%            |
| 2. Type 2 Diabetes Militus | 75       | 0          | 52%            |

The writing of specific main diagnoses in medical record documents for patients with diabetes mellitus shows that the number of patients with specific diagnoses is 144, with 69 documents (48%) using type 1 diabetes mellitus codes, while the remaining 75 specific codes (52%) use type 2 diabetes mellitus codes. The basis for the diagnosis of diabetes is the results of laboratory tests that show blood sugar levels and hemoglobin (HbA1c) tests to measure the average blood glucose 2-3 months back. The specific main diagnosis in diabetes mellitus patients also considers the drugs given to the patient. Certain types of drugs are used as the main treatment for diabetics, so in determining the specification of the diagnosis of prescription drugs need to be reviewed.

### Appropriateness of Diabetes Militus Diagnosis Codes

#### 1. Specific and Appropriate Codes

The specific and appropriate code in the observation is a disease diagnosis code that shows the type of diabetes militus experienced by the patient and proves the correct use of the four digit code. The use of specific and appropriate codes must be in accordance with the services provided to patients when seeking treatment, according to the severity of the patient and refer to secondary diagnoses as complications in patients. Code enforcement of the main diagnosis of diabetes militus that is specific and appropriate based on the observation results as follows;

| Code      | Specific and Corresponding ( $\Sigma$ ) | Percentage (%) |
|-----------|---|----------------|
| 1. E10.1  | 0                                       | 0%             |
| 2. E10.3  | 0                                       | 0%             |
| 3. E10.4  | 5                                       | 6%             |
| 4. E10.5  | 6                                       | 7%             |
| 5. E10.7  | 0                                       | 0%             |
| 6. E10.8  | 5                                       | 6%             |
| 7. E10.9  | 12                                      | 14%            |
| 8. E11.4  | 4                                       | 5%             |
| 9. E11.5  | 32                                      | 36%            |
| 10. E11.7 | 1                                       | 1%             |
| 11. E11.8 | 3                                       | 3%             |
| 12. E11.9 | 19                                      | 22%            |
| 13. E11.3 | 1                                       | 1%             |
|           | <b>88</b>                               | <b>100%</b>    |

Based on the results of specific and appropriate observations, it can be concluded that of the 144 medical record documents reviewed for code suitability, 88 (61%) medical record documents were specific and appropriate. The highest level of conformity in the use of ICD-10 codes for the main diagnosis of diabetes mellitus is obtained in the use of code E11.5 or Non-insulin-dependent diabetes mellitus with peripheral circulatory complications this code is a code that is established in patients with type 2 diabetes mellitus. The percentage of the use of code E11.5 touched 36% or was found in 32 medical record documents.

The code is specific and appropriate if the code indicates the type of diabetes suffered by the patient, and the four digits of the ICD code represent the patient's condition when receiving health services, indicate the severity of the disease and represent concomitant diagnoses or secondary diagnoses. The coder used specific and appropriate codes at 61% with the most frequently used diagnosis being code E11.5 or Non-insulin-dependent diabetes mellitus with peripheral circulatory complications. In the case of diabetes mellitus, peripheral complications can be established as a diagnostic code if the doctor mentions an ulcer or ulcer or gangrene during the patient examination [9]. Patients with ulcers or gangrene will receive treatment in the form of wound care or debridement.

Meanwhile, the number of diagnosis codes that use point nine as the main diagnosis of E10.9 and E11.9 is quite high. Point Nine can be used based on secondary diagnoses that are not relevant to categories 1-4. The types of secondary diagnoses that are irrelevant but often found in diabetes militus cases in Magelang City Hospital are

hypertension and dyspepsia. Both diagnoses are not listed in ICD-10 Volume 3 as a requirement for the use of code points 1-4 as the fourth character [10].

## 2. Specific And Inappropriate Codes

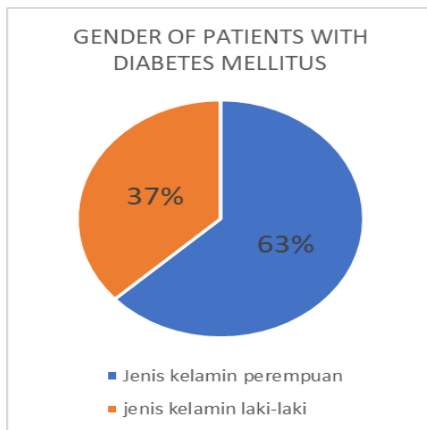
| Code         | Specific and Corresponding ( $\Sigma$ ) | Percentage (%) |
|--------------|---|----------------|
| 1. E10.1     | 1                                       | 2%             |
| 2. E10.3     | 1                                       | 2%             |
| 3. E10.4     | 4                                       | 7%             |
| 4. E10.5     | 9                                       | 16%            |
| 5. E10.7     | 1                                       | 2%             |
| 6. E10.8     | 0                                       | 0%             |
| 7. E10.9     | 25                                      | 45%            |
| 8. E11.4     | 1                                       | 2%             |
| 9. E11.5     | 6                                       | 11%            |
| 10. E11.7    | 1                                       | 2%             |
| 11. E11.8    | 0                                       | 0%             |
| 12. E11.9    | 2                                       | 4%             |
| 13. E11.3    | 5                                       | 9%             |
| <b>Total</b> | <b>56</b>                               | <b>100%</b>    |

Specific and inappropriate codes based on the observation results amounted to 56 medical record documents. If it is represented, the number of medical record documents that are not appropriate reaches 39% of all medical record documents observed for the specification and suitability of the code. The code that was found to be frequently inappropriate was code E10.9 or Insulin-dependent diabetes mellitus without complications, where this code was found 25 times and was the cause of the highest discrepancy in coding.

The code chosen by the coder has the right specifications, but the fourth digit of the code chosen does not show the patient's comorbidities. The error in selecting the fourth digit was motivated by the secondary diagnosis that was not written in full. The researcher found a similar problem when observing, where the secondary diagnosis code was left unfilled in the outgoing resume, but in the integrated patient progress note sheet (CPPT) another diagnosis was written as a secondary diagnosis.

The code E11.4+ or E10.4+ must be written in full with the concomitant diagnosis code, namely amyotrophy (G73.0\*), autonomic neuropathy (G99.0\*), mononeuropathy (G59.0\*) and polyneuropathy (G63.2\*). In the diagnostic coding procedure, two related codes are called dagger and asteric. The asterisk and dagger codes in ICD-10 are used to assign more specific and accurate diagnosis codes. An asterisk code (\*) indicates an additional code associated with the primary code, while a dagger code (†) indicates the primary code associated with the additional code [11].

### Gender of Patients with Diabetes Mellitus

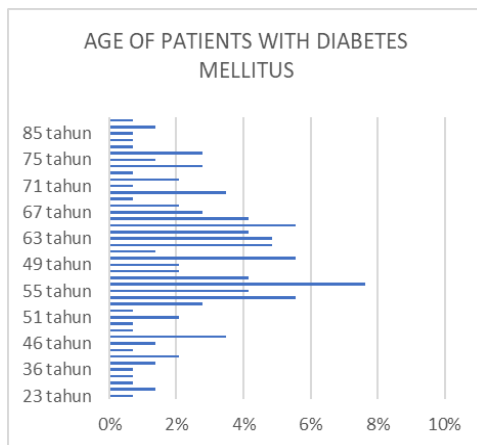


The results showed that the number of cases of diabetes mellitus in women (91 cases) was higher than the number of cases in men (53 cases). This confirms that the incidence of diabetes mellitus is higher in women than in men. Some of the factors that cause an increase in diabetes mellitus rates in women include complex hormonal fluctuations during the menstrual cycle, pregnancy and menopause that can affect the body's sensitivity to insulin. Unhealthy diet and lack of regular physical activity are also major risk factors that are more common in women. Different body fat distribution and a tendency towards abdominal obesity in women can also increase the risk of type 2 diabetes mellitus. Finally, the influence of pregnancy, especially gestational diabetes, can also affect the risk of diabetes mellitus in later life [12], [13].

Women who have a family history of diabetes are at higher risk of developing diabetes [14]. Women become carriers of diabetes to their children. In the context of genetics, a carrier is an individual who has a defective gene but does not show obvious clinical symptoms [15]. Undetected signs and symptoms early on increase the risk of mother-to-child transmission.

The pathophysiology of this condition is that carriers have one copy of the defective gene and one copy of the normal gene, thus showing no symptoms of the disease. However, if they have a child with another person who is also a carrier for the same gene, the child born has a 25% risk of inheriting two copies of the defective gene and developing the disease [16], [17]. It is not surprising that the rate of diabetes in women is much higher than that in men. This is a result of the nature of the carriers themselves as carriers of diabetes. With such a spread, the influence of diabetes from mother to child through genetic pathways is common.

### Age of Patients with Diabetes Mellitus



Diabetes mellitus is a disease that knows no age limits. This is because diabetes can affect individuals of various age ranges, including those who are still young or in their productive age, and poses a high risk to those under the age of [15]. The causes of diabetes in the young age group are often associated with genetic factors, where genetic inheritance plays a key role

as the main trigger. Previous research has shown that type 1 diabetes is often diagnosed in individuals aged between 10-30 years. Age has a significant relationship with the occurrence of type 2 diabetes. Patients over the age of 45 have a higher risk of developing type 2 diabetes [13].

Type 1 diabetes occurs due to abnormalities in the pancreas that disrupt insulin production. Insulin is a hormone produced by the pancreas and is responsible for regulating blood sugar levels. In type 1 diabetes, the pancreas fails to produce enough insulin or does not produce insulin at all, thereby inhibiting the process of sugar metabolism in the body [18]. This condition demands that type 1 diabetes patients control their blood sugar levels with artificial insulin and adopt a healthy lifestyle to manage their condition. In conclusion, type 1 diabetes is a condition in which the pancreas cannot produce enough insulin, leading to an increase in blood sugar levels. The cause of type 1 diabetes is damage to beta cells in the pancreas due to autoimmune processes. Early symptoms of type 1 diabetes include frequent hunger, thirst, urination, weight loss, and fatigue. Treatment for type 1 diabetes includes insulin therapy, diet management, exercise, education, and metabolic control.

While type 2 diabetes militus is a disease that arises due to lifestyle influences and a combination of defects in the process of insulin production, this affects insulin resistance or sensitivity in patients. Based on the natural process of diabetes militus, it can be concluded that type 2 diabetes tends to attack patients at the age of >40 years with the main risk of obesity. Type 2 diabetes can cause various complications, such as heart disease, kidney disease, and visual impairment. These complications can occur if type 2 diabetes is not treated properly [9]. In patients with age >40 years, pancreatic function decreases due to habits during life. Patients with unhealthy lifestyles and not exercising are the most at risk of developing type 2 diabetes. Type 1 diabetes is found less in patients with age >40 years because generally patients with type 1 diabetes are patients with adolescent age (11-20 years) and early adulthood (20-40 years).

### Distribution of Diabetes Militus in Magelang City

The observation shows that patients with diabetes mellitus in Magelang city hospital come from within the city, namely Magelang Utara, Magelang Tengah and Magelang Selatan. While other areas such as Magelang district, Temanggung district, Semarang district and other cities are categorized into out of town. The result of this observation shows that:

|    | Patient Address | Total | Percentage |
|----|-----------------|-------|------------|
| 1. | Out of town     | 98    | 68%        |
| 2. | Magelang City   | 46    | 32%        |

The number of patients who came from Magelang City itself only reached 32%, which is lower than the number of patients who came from outside the city. The reason why the number of patients from out of town is higher is the patient's view regarding the services provided by the hospital is superior compared to other hospitals or health care facilities [19], [20]. In choosing a place of treatment, patients can determine the location of treatment without discrimination. However, for patients with JKN payment methods, the choice of treatment location can be done by considering facilities at lower health services (type C hospitals / puskesmas / Pratama clinics)[21].

|    | Patient Address  | Total | Percentage |
|----|------------------|-------|------------|
| 1. | South Magelang   | 16    | 35%        |
| 2. | North Magelang   | 12    | 26%        |
| 3. | Central Magelang | 18    | 39%        |

The result of this observation shows that the highest number of in-town patients came from Central Magelang with a percentage of 39%. This number is calculated based on the total number of visitors from Magelang city represented by the sample. This high achievement is a concern that requires attention. Special measures to find out the lifestyle of the community to avoid a higher surge of diabetes militus patients in the future.

#### IV. CONCLUSIONS AND SUGGESTIONS

Based on the results of the study "Evaluation of Diagnostic Specifications and Appropriateness of ICD Codes for Diabetes Mellitus Based on Age and Gender of Hospitalized Patients in Magelang City Hospital in 2023", the following conclusions were obtained:

1. The specification of the main diagnosis of diabetes mellitus in Magelang City Hospital is 100%.
2. The suitability of the main diagnosis code of diabetes mellitus based on the category can be concluded that the specific and appropriate code is found as much as 61%. While the specific and inappropriate codes were found to be 39%.
3. The age of patients with diabetes is 23-90 years, the average sufferer is at the age of 59 years. Patients with 56 years of age occupy the highest number of sufferers. While the youngest age of the patient is 23 years old and the oldest age of the patient is 90 years old.
4. Patients with female gender are more dominant in experiencing diabetes mellitus, presented at 63% while male patients are only 37%.
5. The highest distribution of diabetes mellitus patients in Magelang Hospital came from outside the city, namely Magelang District or 68%. Patients in Magelang city only reached 32% when broken down by sub-district with the highest number of patients coming from Magelang Tengah sub-district.

Because the patient's medical record file is not fully complete in the electronic medical record. It takes a long time to browse the files, especially when the system is slow. In future research, it would be better to consider taking the file period to avoid recording medical records during the media transfer period.

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