

## CORRELATION BETWEEN ESTIMATED GLOMERULAR FILTRATION RATE (EGFR) AND MICROALBUMINURIA AT THE KIMIA FARMA PALEMBANG MEDICAL LABORATORY IN 2024

Mutiara Suci Imron<sup>1</sup>, Norma Rotua Simanjuntak<sup>1,2\*</sup>, Siti Sakdiah<sup>1,2</sup>

<sup>1</sup> Departement of Medical Laboratory Technology, Politeknik Kesehatan Kementerian Kesehatan Jambi, Indonesia

<sup>2</sup>PUI-PK, Politeknik Kesehatan Kementerian Kesehatan Jambi, Indonesia

\*Corresponding author: [normarotua@gmail.com](mailto:normarotua@gmail.com)

### ABSTRACT

**Background:** Diabetic nephropathy, a microvascular complication of uncontrolled diabetes mellitus, is signalled early by albumin leakage into urine (microalbuminuria). Estimated glomerular filtration rate (eGFR) also reflects renal function. This study investigated whether eGFR correlates with microalbuminuria in diabetic patients tested at Kimia Farma Palembang Medical Laboratory in 2024.

**Methods:** Descriptive research with a cross-sectional approach. The data were collected as secondary data from August to November 2024. The sampling technique used was purposive sampling, resulting in 191 patients with the inclusion and exclusion criteria. The data were analyzed in univariate and bivariate with the Spearman correlation test.

**Results:** From the research obtained, the average Microalbuminuria in DM patients is 117.40 mg/dL. The results of the Correlation Test showed p value of 0.296 which means a p value > 0.05, means that the correlation is not statistically significant at a confidence level of 95%.

**Conclusion:** There is no correlation between Estimated Glomerular Filtration Rate (eGFR) and Microalbuminuria at the Kimia Farma Palembang Medical Laboratory in 2024. DM patients can reduce the risk of complications leading to kidney failure with optimal glycemic control and perform eGFR and Microalbuminuria laboratory examinations regularly.

**Keywords:** diabetes mellitus; eGFR; microalbuminuria

### INTRODUCTION

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose levels; if its function is impaired, it leads to elevated blood glucose, known as hyperglycemia. Hyperglycemia is a common effect of uncontrolled diabetes and, over time, causes serious damage to many body systems, especially the nerves and blood vessels (WHO, 2023).

Uncontrolled diabetes mellitus can lead to both acute and chronic complications. Acute complications include hypoglycemia, hyperglycemia, diabetic ketoacidosis, and dehydration. Chronic complications can affect the nervous system, large blood vessels, or

small/micro blood vessels. Neuropathy results from nervous system damage, while cardiovascular disease (CVD) stems from large blood vessel damage. Microvascular complications, or microangiopathy, can manifest in organs such as the eyes (retinopathy) and kidneys (nephropathy) (PERKENI, 2021).

Diabetic nephropathy is caused by damage to the small blood vessels in the kidney glomeruli. Normally, proteins in the blood cannot pass through the kidneys. However, if kidney cells are damaged, some protein molecules, particularly albumin, can leak through the blood vessel walls into the urine.

The earliest marker of diabetic nephropathy is the presence of albumin in the urine, initially as microalbumin. As the condition worsens, macroalbuminuria (higher

levels of albumin) is observed (Setiawan, M., 2021).

Globally, the incidence of diabetic nephropathy in adults is projected to increase from 6.4% (285 million) in 2010 to 7.7% (439 million) in 2030. Early detection of diabetic nephropathy can be seen through persistent albuminuria (microalbuminuria) and glomerular filtration rate (PERNEFRI, 2023).

Research on the correlation between estimated glomerular filtration rate (eGFR) and microalbuminuria has produced mixed results. A study by Putri et al. (2021) found no significant correlation between glomerular filtration rate and microalbumin levels. In contrast, Parinding et al. (2021) reported a statistically significant correlation between albuminuria and glomerular filtration rate in patients with uncontrolled type 2 diabetes mellitus.

Based on the above explanation, it is crucial to perform estimated glomerular filtration rate (eGFR) and microalbumin tests to detect the presence of diabetic nephropathy complications in diabetes mellitus patients. Therefore, this study was conducted to analyze the correlation between estimated glomerular filtration rate (eGFR) and microalbuminuria in diabetes mellitus patients at Kimia Farma Medical Laboratory Palembang in 2024.

## METHODS

This study was conducted to examine the correlation between estimated glomerular filtration rate (eGFR) and microalbuminuria in patients diagnosed with diabetes mellitus at the Kimia Farma Medical Laboratory Palembang, in 2024. The study utilized secondary data, with participants selected through purposive sampling, ensuring a targeted and relevant sample.

Data collection occurred between August and November 2024. A descriptive, cross-sectional study design was employed to analyze the potential association between these two key

variables, with a focus on providing insights into the early detection of diabetic nephropathy and optimizing clinical outcomes.

Secondary data were collected through purposive sampling, using specific inclusion and exclusion criteria. The inclusion criteria comprised patients diagnosed with diabetes mellitus (DM), those who had undergone microalbumin and creatinine level testing, and DM patients with microalbumin levels equal to or greater than 30 mg/dL. The exclusion criteria included patients who had microalbumin testing but were not diagnosed with diabetes mellitus (DM).

## RESULTS AND DISCUSSION

### Respondent Characteristics

The respondent characteristics in this study were analyzed based on age group and gender. For age, the analysis was divided into two groups: high risk (>45 years) and low risk ( $\leq$ 45 years). The distribution of characteristics can be seen in the table below.

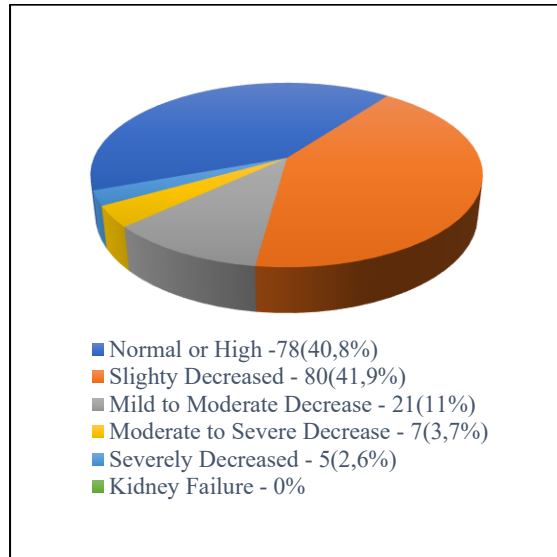
**Table 1 Frequency Distribution of Respondent Characteristics**

| Characteristics             | Frequency (f) | Percentage (%) |
|-----------------------------|---------------|----------------|
| <b>Age</b>                  |               |                |
| High Risk (>45 years)       | 157           | 82,2           |
| Low Risk ( $\leq$ 45 years) | 34            | 17,8           |
| <b>Gender</b>               |               |                |
| Male                        | 39            | 20,4           |
| Female                      | 152           | 79,6           |
| <b>Total</b>                | <b>191</b>    | <b>100,0</b>   |

Based on the data in **Table 1**, the characteristics of DM patients at the Kimia Farma Palembang Medical Laboratory show that the majority are in the high-risk age group (>45 years), accounting for 157 patients (82.2%). In terms of gender, female patients are more predominant, with 152 patients (79.6%) compared to male patients (20.4%). This data indicates that DM patients at the Kimia Farma Palembang Medical Laboratory are predominantly female and over 45 years old.

### Distribution of eGFR and Microalbuminuria at the Kimia Farma Palembang Medical Laboratory

Based on data analysis of the 191 respondents, the distribution of eGFR and microalbuminuria can be seen in the table and graph below.



**Figure 1. Frequency Distribution of Estimated Glomerular Filtration Rate (eGFR) (%)**

The results of this study show that the majority of respondents are in the "Slightly Decreased" eGFR group (41.9%), and no respondents were classified under "Kidney Failure."

**Table 2. Distribution of Microalbuminuria Statistics**

| Variable         | Mean   | Median | SD     | Min | Max |
|------------------|--------|--------|--------|-----|-----|
| Microalbuminuria | 117,40 | 106,00 | 63,077 | 30  | 200 |

Based on **Table 2**, the average microalbuminuria in DM patients was 117.40 mg/dL, with a median of 106.00 mg/dL and a standard deviation of 63.077. The lowest recorded microalbuminuria level was 30 mg/dL, and the highest was 200 mg/dL.

### Correlation Between eGFR and Microalbuminuria at the Kimia Farma Palembang Medical Laboratory

The objective of this study was to examine the correlation between eGFR and microalbuminuria in DM patients at the Kimia Farma Palembang Medical Laboratory. To answer this research objective, a non-

parametric analysis using the Spearman Correlation test was conducted due to the ordinal and ratio scale data used.

**Table 3. Spearman Correlation Test Between eGFR and Microalbuminuria**

| Independent Variable | Dependent Variable | P Value | r     |
|----------------------|--------------------|---------|-------|
| eGFR                 | Microalbuminuria   | 0.296   | 0.076 |

Based on **Table 3**, the results of the Spearman Correlation Test revealed a correlation coefficient of 0.076, indicating a very weak or almost negligible correlation between the two variables. Although the correlation direction is positive, the correlation is not strong enough to be considered statistically significant. Furthermore, the p-value of 0.296 ( $p > 0.05$ ) indicates that the correlation is not statistically significant at the 95% confidence level. Therefore, it can be concluded that there is no significant correlation between eGFR and microalbuminuria at the Kimia Farma Palembang Medical Laboratory.

### CONCLUSION

The distribution of estimated glomerular filtration rate (eGFR) among diabetes mellitus (DM) patients at the Kimia Farma Medical Laboratory in Palembang indicates that the majority fall within the "Normal or High" and "Slightly Decreased" categories. The average level of microalbuminuria in these patients was recorded at 117.40 mg/dL. However, no significant correlation was found between eGFR and microalbuminuria in DM patients at the laboratory in 2024.

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## CONFLICT OF INTEREST

The author declares there is no any conflict of interest during this study.

## REFERENCES

- Abdelwahid, Hassan Ali, dkk. (2022). *Prediktor Mikroalbuminuria Dan Hubungannya Dengan Kontrol Glikemik Diantaranya Pasien Diabetes Tipe 2 Di Rumah Sakit Tni Angkatan Bersenjata Jazan, Barat Daya Arab Saudi*. Tersedia di : <https://doi.org/10.1186/s12902-022-01232-y>. Diakses : 30 Mei 2024
- Alam, Syamsir dan Iwan Hadibroto. (2007). *Gagal Ginjal*. Jakarta : PT. Gramedia Pustaka Utama
- Badan Pusat Statistik Provinsi Sumatera Selatan. (2023). *Kasus Penyakit Menurut Kabupaten/Kota dan Jenis Penyakit di Provinsi Sumatera Selatan*. Tersedia di : <https://sumsel.bps.go.id/id/statistics-table>. Diakses : 23 Oktober 2024
- Bustan M. (2007). *Epidemiologi: Penyakit Tidak Menular*. 2nd ed. Jakarta : Rineka Cipta
- Dinas Kesehatan Provinsi Sumatera Selatan. (2023). *Profil Kesehatan Provinsi Sumatera Selatan*. Palembang : Dinas Kesehatan Provinsi Sumatera Selatan
- Setiawan, Meddy. (2021). *Sistem Endokrin dan Diabetes Melitus*. Malang : UMM Press. Hal 83-84
- Eko Sudarmono Dahad Prihanto, Andri W Johan Imbar, Fitriani Giringan. (2021). *Pengendalian Diabetes Melitus dan Hubungan dengan Kejadian Mikroalbuminuria di Ternate*. Tersedia di : [https://jurnal.syntaxliterate.co.id/index.php/syntax-](https://jurnal.syntaxliterate.co.id/index.php/syntax-literate/article/view/5137)
- [literate/article/view/5137](https://jurnal.syntaxliterate.co.id/index.php/syntax-literate/article/view/5137). Diakses : 13 November 2023
- International Diabetes Federation. (2021). *Diabetes around the world*. Auderghem : IDF Diabetes Atlas 10<sup>th</sup> Edition
- Laboratorium Kimia Farma. (2024). *Laboratory Information System PT Kimia Farma Diagnostika*. Tersedia di : <https://laboratorium.kimiafarma.co.id/data-omset-pasien>. Diakses : 23 Oktober 2024
- Murray, Robert, et.al. (2014). *Biokimia Harper*. Jakarta: EGC. 29th ed. Hal 820
- Pahlevi, Reza. 2021. *Jumlah Penderita Diabetes Indonesia Terbesar Kelima di Dunia*. Tersedia di : <https://databoks.katadata.co.id/datapublish/2021/11/22/jumlah-penderita-diabetes-indonesia-terbesar-kelima-di-dunia> Diakses : 20 Mei 2024
- Parinding, Vania Vinny, dkk. (2021). *Hubungan Albuminuria dan Laju Filtrasi Glomerulus pada Pasien Diabetes Melitus Tipe 2 yang Tidak Terkontrol*. Tersedia di : <http://jurnal.fk.unand.ac.id>. Diakses : 30 Mei 2024
- Perhimpunan Nefrologi Indonesia. (2023). *Konsensus Gangguan Ginjal Akut*. Jakarta Pusat : PERNEFRI
- Perkumpulan Endokrinologi Indonesia. (2021). *Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia*. Jakarta Pusat : PB. PERKENI
- Prasad, Rohan M, dkk. (2023). *Microalbuminuria*. Amerika Serikat: National Library of Medicine
- Putri, Adinda Gina, dkk. (2021). *Hubungan Laju Filtrasi Glomerulus Dengan Kadar Albuminuria Pada Penderita Diabetes Mellitus Tipe 2 Di Puskesmas Simpung Bandar Lampung*. Tersedia di : <http://ejournalmalahayati.Ac.Id/Index.php/Kesehatan>. Diakses : 30 Mei 2024

- Ramadhan, Muhammad. (2020). *Faktor-Faktor yang Berhubungan dengan Kejadian Diabetes Melitus Di Wilayah Kerja Puskesmas Karang Mekar Kota Banjarmasin*. Tersedia di : <https://eprints.uniska-bjm.ac.id/3725/>. Diakses : 13 November 2024
- Seolistijo S., Novida H. (2015). *Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia 2015*. 1st ed. Jakarta : PB PERKENI
- Sulistiyowati, Reny. (2023). *Asuhan Keperawatan pada Klien Gagal Ginjal*. Malang : Unisma Press
- Susanti, Hani. (2019). *Memahami Interpretasi Pemeriksaan Laboratorium Penyakit Ginjal Kronis*. Malang : UB Press
- Timothy L Jones, Mbchb (Hons), Agus Rizal A H Hamid, Ni Made Hustrini. (2021). *Sistem Ginjal dan Seluran Kemih*. Singapore : Elsevier
- World Health Organization. (2010). *Diabetes Mellitus*. Tersedia di : [www.who.int/mediacentre/factsheets/fs138/en](http://www.who.int/mediacentre/factsheets/fs138/en). Diakses : 09 Juni 2024
- World Health Organization. (2023). *Diabetes*. Tersedia di : <https://www.who.int/news-room/factsheets/detail/diabetes>. Diakses : 23 Oktober 2024