

Drop-out to follow up screening of diabetes mellitus in Indonesia from national health insurance data 2022-2024

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Abstract. Diabetes poses a significant public health challenge, particularly in Indonesia where 10.7 million people are affected, and this is predicted to increase to 13.7 million by 2030. Diabetes rates in Indonesia continue to rise and are predicted to affect younger age groups, highlighting the need to strengthen preventive efforts, one of which is conducting earlier DM screening. This study examines the dropout rates in follow-up screenings for diabetes mellitus (DM) among members of Indonesia's National Health Insurance (BPJS) from 2022 to June 2024. The research utilizes a descriptive method. The research variables are the number of BPJS membership, the percentage of Health screening, the percentage of DM risk from screening, the number of follow up, and the results of DM test. The analysis technique uses descriptive analysis. Nationally, the follow-up rate of screening increase from 1.81% in 2022 to 1.98% in 2023. Despite a slight recovery to 1.25% by mid-2024. The mean of follow-up rate nationally to 1.73%. These findings indicate the need for educational campaigns to raise awareness about the importance of DM screening and follow-up care. Further research is necessary to conduct a partial analysis related to community characteristics and factors influencing follow-up screening for DM.

1 Introduction

Diabetes is a chronic (long-term) condition that occurs when there is an increase in blood glucose levels because the body either cannot produce enough insulin or is ineffective in using the insulin produced. Data from the International Diabetes Federation (IDF) indicates that the number of adults (aged 20-79) with diabetes worldwide has reached 537 million. This number is estimated to increase to 643 million by 2030 and 783 million by 2045. Three out of four adults with diabetes live in low- and middle-income countries. In 2021, diabetes was responsible for 6.7 million deaths. Additionally, 541 million adults are experiencing Impaired Glucose Tolerance (IGT), placing them at high risk of developing type 2 diabetes

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[1], [2]. In 2019, Indonesia ranks 7th among the 10 countries (China, India, USA, Pakistan, Brazil, Mexico, Indonesia, Germany, Egypt, and Bangladesh) with the highest number of diabetes cases in the world, with 10.7 million people (aged 20-79) affected, and this number is predicted to increase to 13.7 million by 2030 [3].

The effort to reduce the DM fatality is by providing preventive and promotive programs, such as health screening on BPJS members. BPJS is a National Health Insurance that covers most of the Indonesian people. The BPJS data from 2022 to June 2024 shows that 275,413,133 (97.80%) of Indonesia's population are members of BPJS, although there are 56,149,163 inactive members. The number of BPJS memberships in Indonesian provinces from 2022 to 2024 has increased over the three-year period. The membership in provinces Jawa Barat, Jawa Timur, and Jawa Tengah, reflects the biggest populations [4].

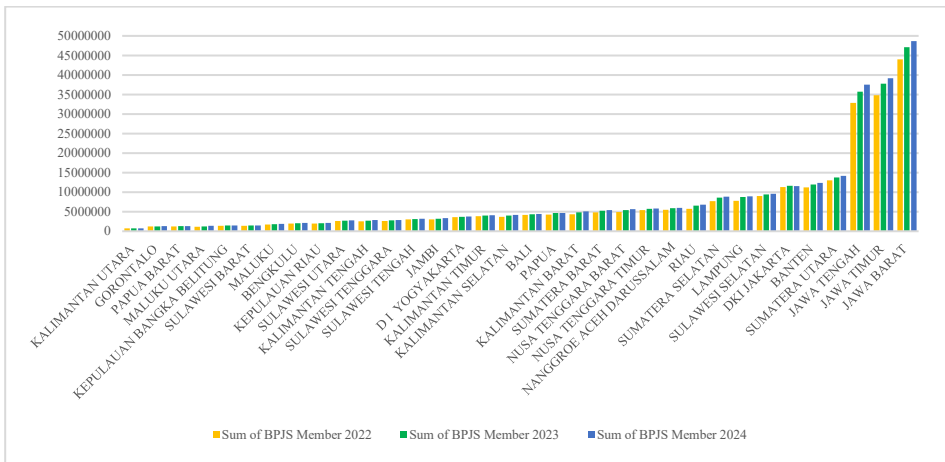


Fig. 1. The number of BPJS members in each province in Indonesia in 2022, 2023, and until June 2024. The total of BPJS members is 248,402,935 (2022), 267,311,566 (2023), and 275.413.133 (until June 2024)

Diabetes mellitus (DM) is a chronic and progressive disease that poses a significant public health challenge globally, particularly in developing countries like Indonesia. Effective management of DM requires early detection and consistent monitoring to prevent complications and reduce morbidity and mortality. In response to this growing burden, BPJS implemented the Chronic Disease Management Program (Program Pengelolaan Penyakit Kronis, Prolanis). This program is designed to improve the quality of life for patients with chronic diseases, including DM, by providing regular screenings, health education, and consistent follow-up care [5]. The implementation of Health History Screening services is carried out to detect the Participant's disease risk which is carried out selectively at Primary Health Facilities consisting of health history anamnesis and physical examination.

Screening can also be carried out independently by participants through the BPJS Health application. The screening results include low risk, moderate risk, and high risk. Participants with low-risk results are advised to make changes to healthy living behavior and/or do health consultations at a Primary Health Facility. Participants with moderate or high-risk results are advised to visit a Primary Health Facility to undergo Health History Screening them. Participants' disease risk based on the examination results at the Primary Health Facility received further examinations including diagnostic support examinations according to medical indications and the competence of the health facility.

Screening Services or Specific Health Screening results follow-up of health History Screening by Primary Health Facilities to detect these diseases and their further impacts. For

example, fasting blood glucose (FBGS) checks post-prandial blood glucose checks for T2DM, and blood pressure checks for hypertension can be done at (1) primary health facilities, (2) primary health facility network laboratories, (3) laboratories that collaborate with BPJS. Participants who based on the examination results, show positive results for T2DM and or hypertension, are recommended to participate in Prolanis (Chronic Disease Management Program). Health improvement for participants with chronic diseases is carried out through Prolanis.

Benefits of Prolanis services include: (1) health consultations and health checks; carried out by an integrated Prolanis team (doctors & health workers and/or other personnel at Primary Health Facilities) (2) medication services, (3) supporting examinations for example in DMT2 patients (FBG once a month, HbA1c once a month, blood chemistry once every 6 months), and hypertension patients (blood chemistry once every 6 months), and (3) group activities; including physical activities and health education involving participants [6].

In Indonesia, the challenge of maintaining consistent follow-up in diabetes screening within Prolanis is particularly critical. The vast geographical landscape, coupled with disparities in healthcare access between urban and rural areas, exacerbates the issue. Furthermore, cultural beliefs and patient perceptions of their health status often influence their willingness to adhere to regular follow-ups [7]. Understanding the reasons behind dropout in follow-up screenings is critical for improving the effectiveness of Prolanis and ensuring better health outcomes for patients with diabetes mellitus.

The Sustainable Development Goal (SDG) target 3.4 calls for a 30% reduction in premature deaths from non-communicable diseases (NCDs), including diabetes, by 2030. Data from Riskesdas shows an increasing trend in diabetes cases, with a prevalence of 5.7% in 2007, 6.9% in 2013, and 8.5% in 2018. Data from the International Diabetes Federation (IDF) in 2021, Indonesia ranks 5th globally for the highest number of diabetes cases, with a prevalence of 19.5%, which is projected to rise to 28.6% by 2030. The IDF provides global estimates of diabetes deaths and prevalence, including type 1 diabetes in people aged 19 years or younger and total diabetes in individuals aged 20–79 years, with the most recent estimates made in 2021. It has also projected future diabetes prevalence through 2045[8]. Therefore, it is crucial to strengthen promotive and preventive measures to prevent diabetes cases at a younger age, including conducting early diabetes screening. This study different from previous research as it utilizes national data from BPJS Kesehatan for the years 2022-2024. This study aims to analyze the demographic characteristics and dropout cases in follow-up diabetes mellitus screening.

2 Method

This research uses the descriptive study design. The data source was taken from Health History Screening Data for BPJS members on January 2022-June 2024. The technique of data collection uses documentation study to describe dropout cases in the number of follow-up diabetes mellitus screening variable of Health History Screening Data for BPJS Participants based on the demographic variable (time, place, and person).

The population and sample are all BPJS health insurance members. The screening data are all the BPJS members who did the screening test by themselves or by health workers in primary health care. The research variables consist of the number of BPJS membership, the percentage of Health screening, the percentage of DM risk from screening, the number of follow up, and the results of DM test. The results of DM test variable was classified into three based on the fasting blood glucose (FBG) consist 1) DM is where the $FBG \geq 126$ mg/dL, (2) pre-DM is where the FBG is between 100-125, (3) normal is where the $FBG < 100$.

The total of BPJS members from January 2022 until June 2024 was included in the analysis which consisted of 248,402,935 in 2022, 267,311,566 in 2023, and 275.413.133 in

January-June 2024. Descriptive analysis using Excel was employed to make the cross-tabulation, pivot table, and pivot graphs.

3 Results

Table 1. The BPJS membership, percentage of health screening, diabetes mellitus risk, the number of follow-ups, and a result of diabetes mellitus tests by province 2022-2024

Province	BPJS Membership			The percentage of Health Screening			The percentage of DM Risk from Screening				The number of follow-ups				Results of DM Test						
	2022	2023	June 2024	2022	2023	June 2024	2022	2023	June 2024	Mean	2022	2023	June 2024	mean	DM	Pre-DM	Normal				
	f	F	F	%	%	%	%	%	%	%	f	%	f	%	f	%	%				
Bali	4.201.697	4.348.503	4.399.395	5.0	13,6	11,2	10,0	1,2	0,7	0,5	0,7	9	0,3	5	0,1	1	0,0	0,2	46,7	46,7	6,7
Banten	11.209.034	11.925.662	12.340.612	4,8	15,4	11,4	10,6	1,0	0,5	0,4	0,5	38	0,7	160	1,7	98	1,8	1,5	56,1	19,6	24,3
Bengkulu	1.963.840	2.079.510	2.114.316	5,9	14,8	9,7	10,2	1,2	0,6	0,4	0,7	4	0,3	35	1,8	6	0,7	1,1	53,3	31,1	15,6
D I Yogyakarta	3.598.381	3.695.959	3.737.693	11,6	21,8	18,5	17,4	2,5	1,6	1,5	1,8	51	0,5	70	0,5	43	0,4	0,5	60,4	17,1	22,6
DKI Jakarta	11.318.723	11.624.558	11.541.584	6,1	18,9	14,2	13,2	2,0	0,8	0,6	0,9	78	0,6	181	1,0	87	0,8	0,8	34,7	28,6	36,7
Gorontalo	1.220.672	1.259.281	1.267.133	5,5	12,7	11,5	9,9	2,5	0,9	1,6	1,5	0	-	4	0,3	0	-	0,1	75,0	25,0	-
Jambi	3.030.529	3.223.964	3.343.251	5,6	11,2	7,3	8,1	1,4	0,8	0,7	0,9	21	0,8	9	0,3	3	0,2	0,5	42,4	36,4	21,2
Jawa Barat	43.979.238	47.079.833	48.641.416	5,4	12,5	9,6	9,3	1,5	0,7	0,6	0,8	709	2,0	472	1,1	174	0,7	1,3	41,5	24,4	34,1
Jawa Tengah	32.883.310	35.687.827	37.485.525	7,3	15,4	11,9	11,6	1,9	0,8	0,7	1,0	1109	2,4	872	2,0	437	1,4	2,0	54,4	19,7	25,9
Jawa Timur	34.821.782	37.774.988	39.191.444	7,1	16,2	14,3	12,7	2,0	0,7	0,6	0,9	461	0,9	1361	3,0	1103	3,1	2,2	56,5	18,2	25,3
Kalimantan Barat	4.376.967	4.861.668	5.060.477	4,9	15,9	8,5	9,9	1,2	0,4	0,6	0,6	7	0,3	41	1,3	40	1,5	1,1	59,1	18,2	22,7
Kalimantan Selatan	3.650.452	4.007.805	4.156.257	6,1	14,3	9,2	10,0	1,4	0,5	0,5	0,7	1	0,0	0	-	0	-	0,0	-	-	100,0
Kalimantan Tengah	2.525.463	2.663.012	2.832.857	4,6	13,4	7,9	8,7	4,0	0,8	0,5	1,2	5	0,1	7	0,2	4	0,4	0,2	43,8	18,8	37,5
Kalimantan Timur	3.852.631	4.048.638	4.128.937	5,1	14,4	10,4	10,1	3,2	1,6	1,6	1,9	153	2,4	63	0,7	39	0,6	1,1	57,6	28,2	14,1
Kalimantan Utara	704.822	741.386	763.785	5,4	14,7	12,4	10,9	1,9	0,8	0,6	0,9	0	-	0	-	1	0,2	0,0	-	-	100,0
Kepulauan Bangka Belitung	1.381.457	1.472.783	1.506.941	6,1	14,6	11,6	10,9	1,4	0,9	1,2	1,1	1	0,1	9	0,5	4	0,2	0,3	57,1	14,3	28,6
Kepulauan Riau	1.947.969	2.074.582	2.135.534	7,7	16,4	8,5	10,9	0,9	0,7	0,7	0,8	22	1,6	64	2,6	13	1,1	1,9	57,6	20,2	22,2
Lampung	7.767.563	8.802.895	8.947.236	7,7	15,9	11,2	11,7	0,9	0,4	0,5	0,5	24	0,4	131	2,5	60	1,3	1,4	57,7	26,5	15,8
Maluku	1.752.889	1.832.682	1.899.940	5,5	11,3	8,9	8,6	0,7	0,4	0,4	0,5	10	1,4	5	0,6	1	0,1	0,7	68,8	18,8	12,5
Maluku Utara	1.112.682	1.254.525	1.355.865	4,5	12,1	5,0	7,3	0,6	0,8	0,5	0,7	2	0,6	4	0,3	2	0,6	0,4	75,0	12,5	12,5
Nangroe Aceh Darussalam	5.495.812	5.907.279	5.948.658	5,9	12,8	11,0	10,0	1,9	1,0	0,8	1,1	32	0,5	33	0,4	0	-	0,3	12,3	43,1	44,6
Nusa Tenggara Barat	4.878.629	5.428.570	5.645.911	4,4	15,0	13,2	11,1	1,5	0,5	0,4	0,6	1	0,0	1	0,0	5	0,2	0,1	85,7	-	14,3
Nusa Tenggara Timur	5.377.296	5.694.651	5.803.091	4,6	12,8	10,2	9,3	1,0	0,4	0,6	0,6	7	0,3	12	0,4	24	0,7	0,5	53,5	9,3	37,2
Papua	4.245.239	4.676.066	4.660.863	3,7	14,2	10,6	9,7	1,0	0,3	0,2	0,3	0	-	2	0,1	4	0,5	0,1	50,0	16,7	33,3
Papua Barat	1.203.231	1.286.127	1.274.482	6,3	20,5	11,5	12,9	1,0	0,3	0,4	0,4	3	0,4	8	1,0	6	1,1	0,8	52,9	5,9	41,2
Riau	5.691.060	6.515.611	6.834.167	5,8	13,7	9,3	9,8	1,6	1,0	0,7	1,0	230	4,4	42	0,5	35	0,8	1,6	26,1	68,7	5,2
Sulawesi Barat	1.394.668	1.480.454	1.508.481	4,4	16,1	9,6	10,1	6,0	2,0	0,7	2,1	1400	38,1	1764	37,3	6	0,6	33,8	15,5	46,0	38,5
Sulawesi Selatan	8.981.465	9.434.092	9.578.953	6,0	13,6	10,1	10,0	1,7	0,8	0,6	0,9	84	0,9	147	1,5	17	0,3	1,0	45,2	25,0	29,8
Sulawesi Tengah	3.024.507	3.149.932	3.220.621	5,4	13,1	8,8	9,1	1,4	1,0	0,7	1,0	1	0,0	10	0,2	2	0,1	0,2	61,5	30,8	7,7
Sulawesi Tenggara	2.602.554	2.786.057	2.846.985	5,1	12,7	9,5	9,2	1,4	0,9	0,7	0,9	12	0,6	20	0,7	3	0,2	0,5	54,3	11,4	34,3
Sulawesi Utara	2.621.345	2.712.978	2.746.031	5,2	11,9	8,9	8,7	3,1	0,9	0,8	1,3	0	-	0	-	4	0,2	0,0	50,0	25,0	25,0
Sumatera Barat	4.846.819	5.250.895	5.376.577	5,5	14,2	9,7	9,9	1,8	0,8	0,5	0,9	23	0,5	32	0,5	8	0,3	0,5	63,5	19,0	17,5
Sumatera Selatan	7.736.518	8.569.511	8.851.860	8,9	16,7	12,9	13,0	0,8	0,4	0,4	0,5	110	1,9	70	1,3	88	2,0	1,7	58,2	16,4	25,4
Sumatera Utara	13.003.691	13.753.172	14.185.903	5,9	13,2	10,7	10,0	1,6	0,8	0,7	0,9	69	0,6	112	0,8	136	1,3	0,9	56,5	14,5	29,0
National	248.402.935	267.311.566	275.413.133	6,2	14,7	11,3	10,8	1,7	0,7	0,6	0,9	4677	1,8	5746	2,0	2454	1,2	1,7	42,8	28,0	29,2

Table 1 describes BPJS membership, health screening, diabetes risk, and follow-up across different provinces in Indonesia from 2022 to June 2024. Although the mean of health screening is still low (10.8%), the health screening percentages generally increased from 2022 to 2023 and mid-2024. DI Yogyakarta and Papua Barat demonstrated the highest screening percentages in 2023.

Some provinces have zero follow-ups, such as Gorontalo (2022, 2024), Kalimantan Selatan (2023, 2024), Kalimantan Utara (2022, 2023), Nangroe Aceh Darussalam (2024), Papua (2022), and Sulawesi Utara (2022,2023). Nationally, the follow-up rate was 1.81% in 2022 and 1.98% in 2023, which is concerningly low.

The detailed descriptive results in Figure 2 shows that in 2023, 14.68% of members (39,231,355) were screened, and then in 2024, the screenings represented only 11.29% (31,061,550) members increased than in 2022 (15,319,739). But the percentage of DM risk from screening in 2023 (0,74%) and mid-2024 (0,63%) less than in 2022 (1,69%).

The follow-ups covered 1.81% of at-DM risk individuals in 2022 then rose to 1.98% in 2023, and fell down to 1.25% until June 2024. Overall, the follow-up is very low compared to people who were diagnosed as “at DM risk. Figure 2 shows the description of the percentage of the number of BPJS members, screening, DM-risk, follow-up, and the results of it.

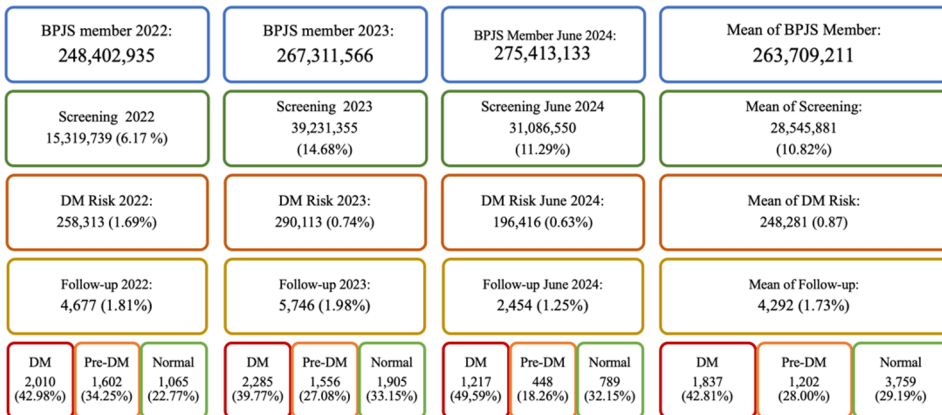


Fig. 2. The BPJS membership, health screening, diabetes mellitus risk, follow-up, and result of diabetes mellitus test by province 2022-2024

Figure 3 represents the number of people of different ages who were screened for diabetes and the number of people who followed up with a glucose test. As we can see, the number of people screened for diabetes increases with age, and the number of people who follow up with a glucose test increases with age, although at a much slower rate. Older people are *more likely* to follow up after a screening.

The number of people screened at each age group varies significantly. For example, many more people in the 40-44 age group were screened than in the 15-19 age group. This means we're comparing different sample sizes.

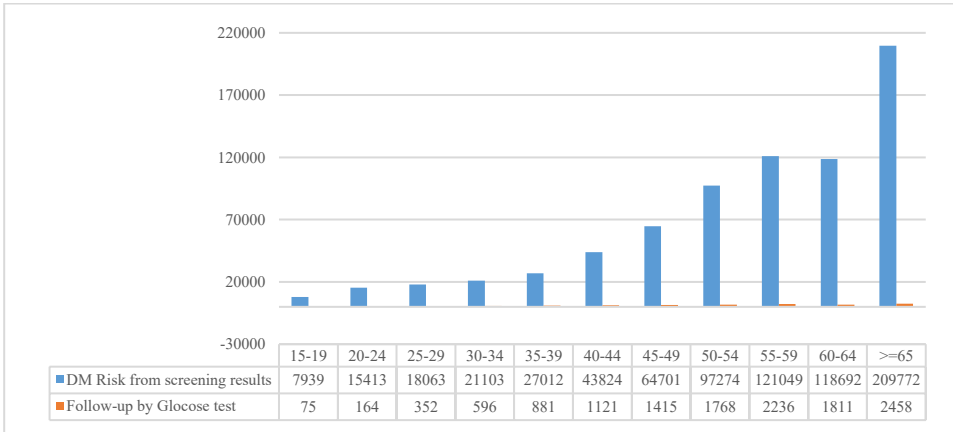


Fig. 3. The comparison of the total people at DM risk and the number of follow-ups by age in 2022-June 2024

Another characteristic from BPJS data is age. Figure 4 shows an increase in the number of DM in the male group from 2022 to 2023 (100,522 to 115,485). The Follow-ups have a similar upward trend with numbers rising from 2022 to 2023, then a slight decrease seen from June 2024. In the female group, an increase is seen from 157,791 in 2022 to 174,628 in 2023, but there is a slight drop by June 2024. It happened because the counting in 2024 is only a half year.

Females have higher "DM risk" in both 2022 and 2024 compared to males, but the number of follow-ups is consistently higher for males than females. For both genders, while the risk is projected to increase significantly over the years, the follow-up numbers increase initially but decrease by June 2024. This suggests a potential gap between rising risk levels and follow-up care, indicating a need for increased follow-up initiatives to match the rising risk.

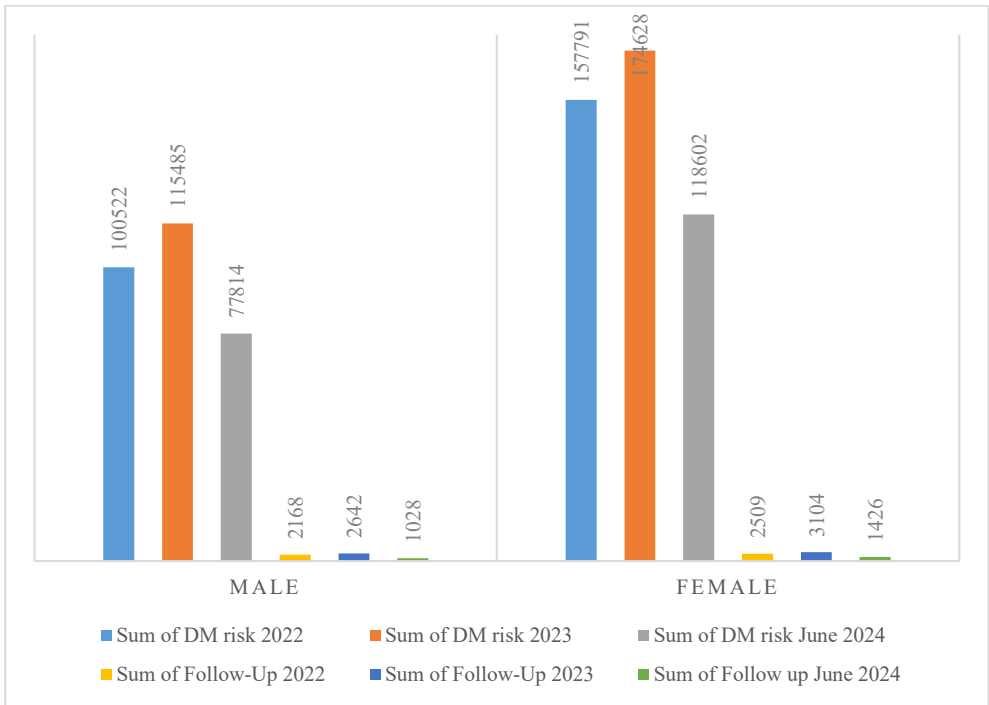


Fig. 4. Increase in the the number of DM the in male group from 2022 to 2023 (100,522 to 115,485).

4 Discussion

The screening for chronic disease, such as type 2 diabetes mellitus is a key first step for effective translation of diabetes prevention, since most people with prediabetes have no symptoms, they do not receive the proper care[9]. This study highlights critical insights into the screening and follow-up processes for diabetes mellitus (DM) under Indonesia's National Health Insurance (BPJS) from 2022 to June 2024. The national average for health screening participation in Indonesia is alarmingly low, at just 10.8%, and although some provinces, such as DI Yogyakarta and Papua Barat, show promising increases in screening rates in 2023, the overall progress is insufficient to face the growing risk of diabetes.

Although the number of health screening in 2023 (39,231,355 members) & mid-2024 (31,086,550 members) increased than in 2022 (15,319,739), but the percentage of DM risk from screening in 2023 (0,74%) and mid-2024 (0,63%) less than in 2022 (1,69%). These results illustrated the possibility of increasing the BPJS participants coverage who did screening, were patients who are still healthy.

Health screening is important for early detection of DM risk, complication prevention [10], cost-effective health care in the future [11], and improve the quality of life [10]. The health screening for BPJS member using mobile JKN (online application) and web-based application can be challenging for particular population where digital literacy and access to technology vary widely in Indonesia. The digital health literacy, the complexity, characteristics and technical issue can affect the people using digital application [12]–[14].

The follow-up rate for those identified as being at DM risk is extremely low. Nationally, the follow-up rate increase from 1.81% in 2022 to 1.98% in 2023. Despite a slight recovery to 1.25% by mid-2024, this remains a significant concern. The effective diabetes management depend on continuous follow-up and monitoring, particularly for individuals at

high risk[15]. The big differences between the number of individuals identified as being at DM risk and those who undergo follow-up care suggests a substantial gap in service delivery or patient compliance.

The data reveals regional disparities in both screening and follow-up efforts. Provinces such as Gorontalo, Kalimantan Selatan, and Sulawesi Utara show zero follow-ups in certain years, suggesting localized barriers to follow-up care. Geographic challenges, such as the remoteness of certain areas and lack of healthcare facilities, are likely contributors. The rural and remote populations in Indonesia face greater difficulty in accessing follow-up care, largely due to limited transportation options, poor health infrastructure, and financial constraints[16], [17].

The demographic breakdown of screening and follow-up by age reveals that older individuals are more likely to follow up after an initial screening. Older adults, those with higher income, were more likely to attend screenings regularly, while those with lower income and education were less likely to do it [18]. However, the significant drop-off in follow-up rates among younger age groups is concerning, as early intervention is critical in younger populations to prevent long-term complications from diabetes. The older people and younger people experienced in low health literacy and it could be the barrier in access and using health care[19].

Another factor contributing to low follow-up rates may be the administrative complexity in health care, like long wait times, scheduling follow-up appointments, and limited availability of healthcare providers may deter individuals from returning for follow-up care[16], [20].

5 Conclusion

Some provinces have zero follow-ups of patient DM risk, such as Gorontalo (2022, 2024), Kalimantan Selatan (2023, 2024), Kalimantan Utara (2022, 2023), Nangroe Aceh Darusalam (2024), Papua (2022), and Sulawesi Utara (2022,2023). Nationally, the follow-up rate of screening increase from 1.81% in 2022 to 1.98% in 2023. Despite a slight recovery to 1.25% by mid-2024. The mean of follow-up rate nationally to 1.73%. These findings indicate the need for educational campaigns to raise awareness about the importance of DM screening and follow-up care, especially in regions with low health literacy. Further research is necessary to conduct a partial analysis related to community characteristics and factors influencing follow-up screening for DM. The integration of digital health technologies, such as mobile health apps for tracking and reminding patients about follow-up care appointments, could help bridge the gap between screening and follow-up care.

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