National Diabetes Registry

National Diabetes Registry Report 2020

Disease Control Division
Ministry of Health Malaysia

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Executive Summary

This report presents the clinical outcome, treatment, and complications among audited Type 2 Diabetes Mellitus (T2DM) patient records for the year 2020 that was derived from the National Diabetes Registry (NDR) in comparison with 2019.

According to the registry dataset, there was a total of 1,698,683 patients enrolled in the registry and there were 902,991 active diabetes patients in the NDR at the end of the reporting year for 2020, of which 99.33% were diagnosed with T2DM.

The majority of T2DM patients were between 55-59 years old (16.59%) and the mean age at diagnosis was 53 years old. The majority of patients were female (57.02%) and Malay ethnicity (59.35%).

From the findings of the clinical audit, the mean glycosylated haemoglobin (HbA_{1c}) had reduced from 7.9% (2019) to 7.8% (2020). The overall trend of patients achieving the Ministry of Health Diabetes Quality Assurance (QA) target of HbA_{1c} ≤6.5% has gradually increased over the years. For the QA target, in 2020, 30.70% of patients achieved the target of HbA_{1c} ≤6.5%, an increase from 27.64% in 2019. A variation could be observed between states for the target achievements.

In 2020, 80.00% had hypertension and 75.72% had dyslipidaemia. As for total complications, 14.38% of patients had diagnosed nephropathy, 11.52% had the presence of retinopathy, and 5.64% were reported to have ischaemic heart disease (IHD).

Metformin (84.30%) was the most common oral anti-diabetic drug (OAD) used among T2DM patients, followed by sulphonylureas (44.60%). Meanwhile, 30.02% of patients were treated with insulin in 2020 compared to 30.36% in 2019. Calcium channel blockers (56.50%) and angiotensin-converting enzyme inhibitors (ACE-i) (53.23%) were the most commonly used anti-hypertensive in 2020. Acetylsalicylic acid (18.08%) and statins (81.96%) were the most commonly used anti-platelet and anti-lipid drugs.

There are several limitations to the NDR data. The NDR relies on the quality of documentation at the primary health clinics. To limit the burden of data collection, NDR audit is conducted through a random sampling method via a web-based data entry system. In 2020, the sample size was reduced significantly, while remaining representative, to cope with the disruptions due to the COVID-19 pandemic.

Abbreviations

2HPP	2-hour post-prandial blood glucose
ACE-i	Angiotensin-converting enzyme inhibitors
BMI	Body Mass Index
BP	Blood pressure
CVD	Cardiovascular disease
CI	Confidence interval
CPG	Clinical Practice Guideline
ECG	Electrocardiogram
FBS	Fasting blood glucose
HbA_{1c}	Glycosylated haemoglobin
HDL	High-density lipoprotein
IHD	Ischaemic heart disease
IQR	Inter-quartile range
KK	Health Clinic (*Klinik Kesihatan*)
LDL	Low-density lipoprotein
MOH	Ministry of Health
NCD	Non-communicable disease
NDR	National Diabetes Registry
NHMS	National Health and Morbidity Survey
OAD	Oral anti-diabetic drug
QA	Quality Assurance
RBS	Random blood sugar
T1DM	Type 1 diabetes mellitus
T2DM	Type 2 diabetes mellitus
TG	Triglycerides

Definition

Active T2DM patients	Patients with Type 2 Diabetes Mellitus with at least one visit to the health clinic within one year of the date of clinical audit
Registry patients	Patients diagnosed with diabetes and registered at any of the participating health clinics
Audited patients	Active T2DM patients who were sampled in the clinical audit year

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Acknowledgement

Special recognition to the personnel of all the healthcare facilities who continue to provide effective and sustained care for all Non-communicable Disease (NCD) patients in Malaysia, despite the challenges of the COVID-19 pandemic. The National Diabetes Registry database and this report would not have been possible without their substantial contribution. It is wished that the clinic teams will find the data beneficial, enabling them to visualise improvements along with monitoring performance at the facility level.

We would as well to express our gratitude to all State NCD Public Health Officers who have contributed their time and also thoughts to making the annual clinical audit a successful one for many years.

A special mention to En. Nazri Abdullah and Pn. Fathilah Abdul from Disease Control Division for collating the data required to produce this report.

About This Report

This report is the first annual publication for the National Diabetes Registry (NDR). Previous reports collated information for longer-term periods, 2009-2012 and 2013-2020. From 2020 onwards, we intend to share the data contained within the NDR annually for clinicians, public health specialists, researchers and all those who are interested in the clinical management of diabetes.

About National Diabetes Registry

The objectives of the NDR are:

i. To enable tracking of glycaemic control and clinical outcomes of patients with diabetes managed at MOH health clinics
ii. To enable comparisons over time and across geographical locations
iii. Enable research to improve the quality of care provided to patients

The NDR has been a collaborative effort among MOH health clinics and hospitals that leverages existing data collection requirements and processes. The registry is a useful tool to better understand patterns of disease and clinical management of patients managed within the MOH to prevent complications and improve patient management and future outcomes.

National Diabetes Registry Components

The NDR contains information on patients with diabetes managed at participating MOH health clinics (*klinik kesihatan* or KKs) and consists of two related components: (i) patient registry and (ii) clinical audit datasets.

As baseline information, the NDR collects basic socio-demographic information, clinical and outcome data of all patients with DM managed in MOH health clinics and selected hospitals in the patient registry. At the end of December 2020, the patient registry contained nearly 1.7 million unique patient records.

The audit dataset is a subset of the patient registry. The Diabetes Clinical Audit is conducted on randomly sampled active T2DM patients on follow-up at MOH health clinics. Universal data entry for clinical variables is not currently feasible as the medical records in the majority of MOH health clinics are still paper-based. The NDR has allowed greater efficiency to conduct the annual Diabetes Clinical Audit. The clinical audit dataset has more complete information as it captures clinical variables, drug use and outcomes of care data for audited patients.

Methodology

Site Selection Criteria

All MOH KKs managing patients with diabetes in 2020 were eligible for inclusion in this report. At the end of 2020, 876 KKs throughout Malaysia have provided data to the NDR.

Patient selection criteria

The NDR includes all forms of diabetes, except gestational diabetes. However, for clinical data analysis, only T2DM patients are reported.

Data collection

The NDR is a web-based application. The database contains information about patients with diabetes receiving care at participating KKs.

The following data is collected for all diabetes patients:

i. Sociodemographic information
ii. Type of Diabetes
iii. Date Diagnosed
iv. Diabetes-Related Complications
v. Comorbidities

Clinical Audit for Diabetes Patients

Annually, randomly sampled T2DM patients meeting the selection criteria are selected for clinical audit whereby more detailed clinical data is collected. The sampled population comes from active patients with T2DM enrolled in the registry dataset.

The workflow for data collection for clinical audit is described in the first NDR Report.

Sample size estimation

The sample of patients with T2DM required for the clinical audit from each district was based on the number of active patients registered in each district and the sample size calculation is described in the first NDR Report.

Statistical methods

Results below present descriptive statistical analysis as generated by the NDR web-based application, and are presented as categorical variables (n, %) or continuous variables (mean, 95% CI and/or median, IQR).

Results below were generated using data from the NDR for 2019-2020 that was extracted on 31st December 2 020.

Clinical Setting

A total of 876 MOH KKs from all states in Malaysia submitted data to the NDR in the reporting period ending 2020. The distribution of KKs providing data to the NDR by state is shown in Table 1.

Table 1 - Distribution of KKs enrolled in the NDR registry by state, 2020

State	Number of KKs
Johor	97
Kedah	57
Kelantan	69
Melaka	30
Negeri Sembilan	49
Pahang	81
Perak	76
Perlis	10
P. Pinang	28
Sabah	78
Sarawak	161
Selangor	73
Terengganu	48
WP Kuala Lumpur	14
WP Labuan	1
WP Putrajaya	4
Malaysia	876

General Findings

Patients Population

There was a total of 1,698,683 patients enrolled in the registry and there were 902,991 active diabetes patients in the NDR at the end of the reporting year for 2020. Nearly all the patients enrolled in the NDR were diagnosed with T2DM (99.33%), followed by T1DM (0.59%) and others (0.06%).

The characteristics of patients are shown in Table 2. There were 57.02% women and 42.98% men, respectively. The ethnic distribution was as follows: Malay 59.35%, Chinese 19.42%, Indian 12.98%, and others at 8.24%.

The age at diagnosis of patients with diabetes is reported in Table 3. The mean age at diagnosis of T2DM patients registered in NDR was 53 years. The characteristics of patients according to states are shown in Table 4. There were more females than males with diabetes in all states except WP Putrajaya. The mean age of T2DM patients ranged between 58 to 65 years.

Table 2 - Characteristics of Patients enrolled in National Diabetes Registry, 2020 [Registry Dataset]

Variable	n	%
Sex		
Male	731,098	42.98
Female	967,585	57.02
Total	1,698,683	100.00
Ethnicity		
Malay	1,008,172	59.35
Chinese	329,805	19.42
Indian	220,596	12.98
Others	140,110	8.25
Total	1,698,683	100.00
Age Group (at Enrollment, years)		
<18	5,271	0.31
18-19	2,657	0.16
20-24	11,003	0.65
25-29	28,649	1.69
30-34	59,853	3.52
35-39	104,734	6.17
40-44	170,300	10.03
45-49	237,865	14.00
50-54	291,474	17.16
55-59	281,759	16.59
60-64	216,957	12.77
65-69	144,782	8.52
70-74	84,326	4.96
75-79	40,351	2.38
>80	18,702	1.10
Total	1,698,683	100.00
Type of Diabetes		
Type 2	1,687,384	99.33
Type 1	10,184	0.59
Others/Unknown	1,115	0.06
Total	1,698,683	100.00

Table 3 - Age at Diagnosis of Type 2 Diabetes Mellitus Patients (in years) [Registry Dataset]

	Age at diagnosis
Mean age	53
Median	53
Inter-Quartile range	16.0

Most of the registered patients in NDR were diagnosed with diabetes between the age of 50-54 (17.16%) years old, followed by 55-59 (16.59%) years and 45-49 (14.00%) years age group, as shown in Figure 1.

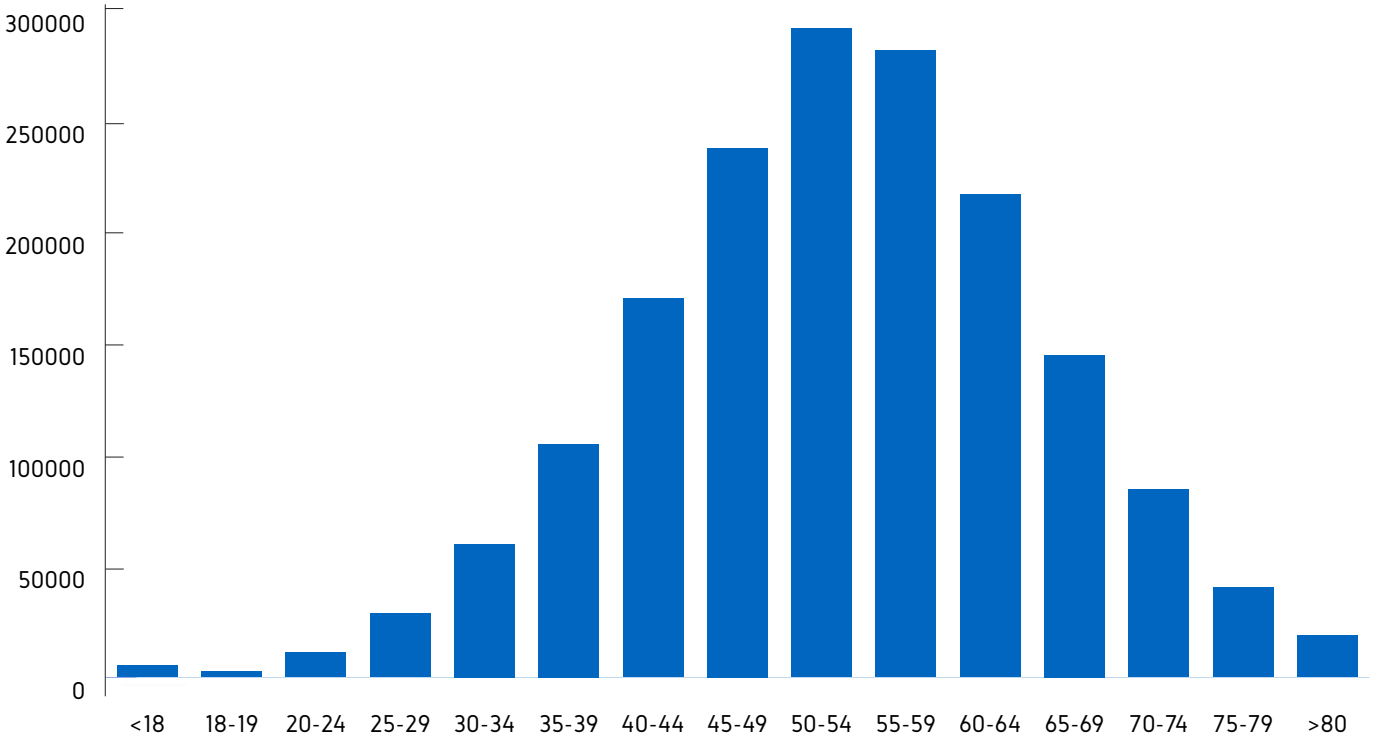

Figure 1 - Distribution of T2DM patients according to age at diagnosis [Registry Dataset]

Table 4 - Characteristics of diabetes patients enrolled in National Diabetes Registry, 2020, by State

State	No. of patients n (%)	Male n (%)	Mean age (95%CI)	Ethnicity, n (%)				
				Malay	Chinese	Indian	Other Malaysian	Foreigner/ Unknown
MALAYSIA	1,698,683 (100.00)	731,098 (42.98)	63 (63.2-63.3)	1,008,172 (59.35)	329,805 (19.41)	220,596 (12.98)	121,915 (7.17)	18,195 (1.07)
Johor	240,445 (14.15)	104,700 (43.54)	64 (63.5-63.6)	152,161 (63.28)	57,522 (23.92)	28,959 (12.04)	955 (0.39)	865 (0.35)
Kedah	158,193 (9.31)	65,905 (41.66)	62 (61.8-61.9)	123,167 (77.85)	15,922 (10.06)	17,118 (10.82)	56 (0.03)	1,846 (1.16)
Kelantan	66,320 (3.90)	25,245 (38.06)	64 (63.6-63.8)	62,825 (94.73)	2,574 (3.88)	322 (0.48)	23 (0.03)	577 (0.87)
Melaka	93,647 (5.51)	41,474 (44.28)	64 (64.3-64.5)	63,917 (68.25)	19,412 (20.72)	9,456 (10.09)	135 (0.14)	581 (0.62)
Negeri Sembilan	113,985 (6.71)	50,913 (44.66)	65 (64.4-64.6)	67,733 (59.42)	20,468 (17.95)	25,039 (24.16)	386 (0.33)	422 (0.37)
Pahang	99,472 (5.85)	43,455 (43.68)	63 (63.0-63.2)	75,517 (75.91)	15,039 (15.11)	7,953 (7.99)	521 (0.52)	475 (0.47)
Perak	183,734 (10.81)	81,176 (44.18)	65 (64.5-64.6)	102,426 (55.74)	42,398 (23.07)	37,340 (20.32)	663 (0.36)	866 (0.47)
Perlis	31,265 (1.84)	12,931 (41.35)	63 (62.6-62.9)	26,864 (85.23)	2,755 (8.81)	665 (2.12)	31 (0.09)	816 (2.60)
Pulau Pinang	92,842 (5.40)	41,740 (44.95)	65 (64.8-64.9)	41,517 (44.71)	33,865 (36.47)	17,026 (18.33)	58 (0.06)	485 (0.52)
Sabah	52,447 (3.08)	23,003 (43.85)	61 (61.3-61.5)	2451 (4.67)	10,785 (20.56)	414 (0.78)	32,873 (62.67)	6,042 (11.52)
Sarawak	171,093 (10.07)	69,015 (40.33)	62 (61.9-62.1)	43,989 (25.71)	40,723 (23.80)	671 (0.39)	83,867 (49.01)	1,781 (1.04)
Selangor	242,464 (14.27)	106,050 (43.73)	63 (62.7-62.8)	135,338 (55.81)	43,532 (17.95)	60,604 (24.99)	777 (0.32)	2,278 (0.93)
Terengganu	70,127 (4.12)	27,322 (38.96)	62 (61.5-61.7)	68,431 (97.58)	1,416 (2.01)	90 (0.12)	18 (0.02)	133 (0.18)
WP Kuala Lumpur	69,630 (4.09)	30,838 (44.28)	65 (64.9-65.1)	31,744 (45.58)	22,491 (32.30)	14,515 (20.84)	157 (0.22)	726 (1.04)
WP Labuan	4,303 (0.25)	1,845 (42.87)	59 (58.6-59.4)	2,042 (47.45)	647 (15.03)	46 (1.06)	1,349 (31.35)	270 (6.27)
WP Putrajaya	8,716 (0.51)	4,486 (51.46)	58 (57.5-58.0)	8,050 (92.35)	256 (2.93)	378 (4.33)	46 (0.52)	32 (0.36)

Comorbidities and Complications

Table 5 shows the presence of comorbidities and complications among diabetes patients in the clinical audit dataset.

The prevalence of hypertension among T2DM patients has remained at 80.40% in 2019 and 80.00% in 2020. In the year 2020, Johor has the highest percentage of patients with hypertension (85.72%), followed by WP Kuala Lumpur (85.51%) and Sarawak (84.55%). Meanwhile, the prevalence of dyslipidaemia has increased from 74.30% in 2019 to 75.72% in 2020. In the year 2020, WP Kuala Lumpur reported the highest proportion of patients with dyslipidemia (88.74%), followed by Perlis (87.65%) and Pulau Pinang (84.63%).

The prevalence of nephropathy among diabetes patients has reduced from 14.60% in 2019 to 14.38% in 2020. WP Putrajaya (30.57%), Johor (29.83%) and WP Kuala Lumpur (28.16%) were the top three states with nephropathy in the year 2020. The proportion of patients diagnosed with retinopathy has increased from 10.60% in 2019 to 11.52% in 2020. WP Putrajaya (21.33%), WP Kuala Lumpur (16.27%) and Perlis (16.00%) reported the highest proportion of patients with retinopathy in 2020.

The proportion of patients with Ischaemic Heart Disease (IHD) has reduced from 5.86% in 2019 to 5.64% in 2020. Johor (10.55%), Pulau Pinang (10.22%) and WP Kuala Lumpur (6.82%) reported the highest proportion of diabetes patients with IHD in 2020. The prevalence of cerebrovascular disease increased from 1.79% in 2019 to 1.88% in 2020. The proportion of patients with diabetic foot ulcers remains at 1.23% and 1.24% in 2019 and 2020, respectively. Similarly, the proportion of patients with amputations remains at 0.68% and 0.73% for both years. The prevalence of erectile dysfunction among the men screened increased from 14.54% in 2019 to 15.50% in 2020.

Nationally, in 2020, the proportion of “unknown” for each of the conditions ranged between 0.52% - 2.14%. In comparison to the previous reports, this proportion is lower.

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019-2020 [Audit Dataset]

States	Comorbidities							
	Hypertension							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	146,032 (80.40)	34,721 (19.10)	881 (0.50)	88,457	70,762 (80.00)	17,237 (19.49)	458 (0.52)
Johor	35,055	29,361 (83.76)	5,555 (15.85)	139 (0.40)	7,415	6,356 (85.72)	1,039 (14.01)	20 (0.27)
Kedah	7,576	5,868 (77.46)	1,676 (22.12)	32 (0.42)	7,916	6,219 (78.56)	1,673 (21.13)	24(0.30)
Kelantan	17,606	14,386 (81.71)	3,185 (18.09)	35 (0.20)	8,870	7,152 (80.63)	1,694 (19.10)	24 (0.27)
Melaka	11,818	8,733 (73.90)	3,072 (26.00)	13 (0.11)	12,528	9,375 (74.83)	3,121 (24.91)	32 (0.26)
N. Sembilan	16,893	12,553 (74.31)	4,322 (25.58)	18 (0.11)	5,158	3,880 (75.22)	1,274 (24.70)	4 (0.08)
Pahang	19,265	15,216 (78.98)	3,947 (20.49)	102 (0.53)	7,324	5,911 (80.71)	1,370 (18.71)	43 (0.59)
Perak	7,693	6,130 (79.68)	1,498 (19.47)	65 (0.84)	7,689	6,156 (80.06)	1,420 (18.47)	113 (1.47)
Perlis	800	662 (82.75)	138 (17.25)	0 (0.00)	850	706 (83.06)	144 (16.94)	0 (0.00)
P. Pinang	3,668	2,951 (80.45)	705 (19.22)	12 (0.33)	2,935	2,391 (81.47)	533 (18.16)	11 (0.37)
Sabah	12,560	10,295 (81.97)	2,208 (17.58)	57 (0.45)	6,534	5,323 (81.47)	1,162 (17.78)	49 (0.75)
Sarawak	18,340	15,582 (84.96)	2,546 (13.88)	212 (1.16)	2,886	2,440 (84.55)	408 (14.14)	38 (1.32)
Selangor	7,647	6,437 (84.18)	1,148 (15.01)	62 (0.81)	6,919	5,846 (84.49)	1,031 (14.90)	42 (0.61)
Terengganu	12,283	9,305 (75.76)	2,863 (23.31)	1,115 (0.94)	7,054	5,395 (76.48)	1,608 (22.80)	51 (0.72)
WP KL	7,873	6,657 (84.55)	1,201 (15.25)	15 (0.19)	3,079	2,633 (85.51)	440 (14.29)	6 (0.19)
WP Labuan	1,145	833 (72.75)	310 (27.07)	2 (0.17)	564	432 (76.60)	132 (23.40)	0 (0.00)
WP Putrajaya	1,412	1,063 (75.28)	347 (24.58)	2 (0.14)	736	547 (74.32)	188 (25.54)	1 (0.14)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Dyslipidemia							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	135,015 (74.30)	45,308 (24.90)	1,311 (0.70)	88,457	66,981 (75.72)	20,892 (23.62)	584 (0.66)
Johor	35,055	28,286 (80.69)	6,542 (18.66)	227 (0.65)	7,415	6,152 (82.97)	1,230 (16.59)	33 (0.45)
Kedah	7,576	6,024 (79.51)	1,519 (20.05)	33 (0.45)	7,916	6,460 (81.61)	1,433 (18.10)	23 (0.29)
Kelantan	17,606	13,629 (77.41)	3,920 (22.27)	57(0.32)	8,870	6,666 (75.15)	2,171 (24.48)	33 (0.37)
Melaka	11,818	6,768 (57.27)	5,032 (42.58)	18 (0.15)	12,528	7,557 (60.32)	4,941 (39.44)	30 (0.24)
N. Sembilan	16,893	10,880 (64.41)	5,984 (35.42)	29 (0.17)	5,158	3,460 (67.08)	1,691 (32.78)	7 (0.14)
Pahang	19,265	13,803 (71.65)	5,299 (27.51)	163 (0.85)	7,324	5,482 (74.85)	1,775 (24.24)	67 (0.91)
Perak	7,693	5,859 (76.16)	1,728 (22.46)	106 (1.38)	7,689	6,076 (79.02)	1,494 (19.43)	119 (1.55)
Perlis	800	697 (87.13)	103 (12.88)	0 (0.00)	850	745 (87.65)	105 (12.35)	0 (0.00)
P. Pinang	3,668	3,055 (83.29)	594 (16.19)	19 (0.52)	2,935	2,484 (84.63)	440 (14.99)	11 (0.37)
Sabah	12,560	8,959 (71.33)	3,495 (27.83)	106 (0.84)	6,534	4,909 (75.13)	1,557 (23.83)	68 (1.04)
Sarawak	18,340	13,466 (73.42)	4,583 (24.99)	291 (1.59)	2,886	2,174 (75.33)	654 (22.66)	58 (2.01)
Selangor	7,647	6,216 (81.29)	1,340 (17.52)	91 (1.19)	6,919	5,725 (82.74)	1,130 (16.33)	64 (0.92)
Terengganu	12,283	9,074 (73.87)	3,072 (25.01)	137 (1.12)	7,054	5,400 (76.55)	1,594 (22.60)	60 (0.85)
WP KL	7,873	6,649 (84.45)	1,199 (15.23)	25 (0.32)	3,079	2,724 (88.74)	346 (11.24)	9 (0.29)
WP Labuan	1,145	498 (43.49)	641 (55.98)	6 (0.52)	564	366 (64.89)	197 (34.93)	1 (0.18)
WP Putrajaya	1,412	1,152 (81.59)	257 (18.20)	3 (0.21)	736	601 (81.66)	134 (18.21)	1 (0.14)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Nephropathy							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	26,434 (14.60)	152,245 (83.80)	2,955 (1.60)	88,457	12,721 (14.38)	74,320 (84.02)	1,416 (1.60)
Johor	35,055	9,054 (25.83)	25,531 (72.83)	470 (1.34)	7,415	2,212 (29.83)	5,148 (69.43)	55 (0.74)
Kedah	7,576	1,011 (13.34)	6,470 (85.40)	95 (1.25)	7,916	1,135 (14.34)	6,723 (84.93)	58 (0.73)
Kelantan	17,606	2,730 (15.51)	14,774 (83.91)	102 (0.58)	8,870	1,290 (14.54)	7,538 (84.98)	42 (0.47)
Melaka	11,818	832 (7.04)	10,964 (92.77)	22 (0.19)	12,528	854 (6.82)	11,552 (92.21)	122 (0.97)
N. Sembilan	16,893	1,589 (9.41)	15,245 (90.24)	59 (0.35)	5,158	463 (8.98)	4,679 (90.71)	16 (0.31)
Pahang	19,265	2,580 (13.39)	16,325 (84.74)	360 (1.86)	7,324	1,022 (13.95)	6,143 (83.87)	159 (2.17)
Perak	7,693	884 (11.52)	6,545 (85.08)	264 (3.43)	7,689	1,071 (13.93)	6,307 (82.03)	311 (4.04)
Perlis	800	92 (11.50)	708 (88.50)	0 (0.00)	850	171 (20.12)	678 (79.76)	1 (0.12)
P. Pinang	3,668	616 (16.78)	3,001 (81.82)	51 (1.39)	2,935	487 (16.59)	2,398 (81.70)	50 (1.70)
Sabah	12,560	1,222 (9.73)	11,250 (89.57)	88 (0.70)	6,534	687 (10.51)	5,775 (88.38)	72 (1.10)
Sarawak	18,340	973 (5.31)	16,667 (90.88)	700 (3.82)	2,886	175 (6.06)	2,609 (90.40)	102 (3.53)
Selangor	7,647	1,359 (17.77)	6,017 (78.68)	271 (3.54)	6,919	1,170 (16.91)	5,493 (79.39)	256 (3.70)
Terengganu	12,283	1,455 (11.85)	10,455 (85.12)	373 (3.04)	7,054	885 (12.55)	6,046 (85.71)	123 (1.74)
WP KL	7,873	1,602 (20.35)	6,178 (78.47)	93 (1.18)	3,079	867 (28.16)	2,166 (70.35)	46 (1.49)
WP Labuan	1,145	12 (1.05)	1,127 (98.43)	6 (0.52)	564	7 (1.24)	554 (98.23)	3 (0.53)
WP Putrajaya	1,412	423 (29.96)	988 (69.97)	1 (0.07)	736	225 (30.57)	511 (69.43)	0 (0.00)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Retinopathy							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	19,246 (10.60)	158,200 (87.00)	4,188 (2.40)	88,457	10,187 (11.52)	76,380 (86.35)	1,890 (2.14)
Johor	35,055	4,809 (13.74)	29,613 (84.48)	633 (1.81)	7,415	1,133 (15.28)	6,216 (83.83)	66 (0.89)
Kedah	7,576	824 (10.88)	6,564 (86.64)	188 (2.48)	7,916	1,016 (12.83)	6,792 (85.80)	108 (1.36)
Kelantan	17,606	2,309 (13.11)	15,133 (85.95)	164 (0.93)	8,870	1,090 (12.29)	7,702 (86.83)	78 (0.88)
Melaka	11,818	1,061 (8.98)	10,737 (90.85)	20 (0.17)	12,528	1,025 (8.18)	11,378 (90.82)	125 (1.00)
N. Sembilan	16,893	1,055 (6.25)	15,779 (93.41)	59(0.35)	5,158	328 (6.36)	4,810 (93.25)	20 (0.39)
Pahang	19,265	1,620 (8.41)	17,096 (88.74)	549 (2.85)	7,324	578 (7.89)	6,552 (89.46)	194 (2.65)
Perak	7,693	844 (11.02)	6,503 (84.53)	346 (4.50)	7,689	977 (12.71)	6,324 (82.25)	388 (5.05)
Perlis	800	139 (17.38)	661 (82.63)	0 (0.00)	850	136 (16.00)	713 (83.88)	1 (0.12)
P. Pinang	3,668	549 (14.97)	3,040 (82.88)	79 (2.15)	2,935	465 (15.84)	2,392 (81.50)	78 (2.66)
Sabah	12,560	1,536 (12.23)	10,849 (86.38)	175 (1.39)	6,534	953 (14.59)	5,456 (83.50)	125 (1.91)
Sarawak	18,340	784 (4.79)	16,552 (90.25)	1,004 (5.47)	2,886	97 (3.36)	2,6.38 (91.41)	151 (5.23)
Selangor	7,647	932 (12.19)	6,356 (83.12)	359 (4.69)	6,919	890 (12.86)	5,700 (82.38)	329 (4.76)
Terengganu	12,283	1,257 (10.23)	10,571 (86.06)	455 (3.70)	7,054	833 (11.81)	6,077 (86.15)	142 (2.01)
WP KL	7,873	1,199 (15.23)	6,536 (83.02)	138 (1.75)	3,079	501 (16.27)	2,500 (81.20)	78 (2.53)
WP Labuan	1,145	17 (1.48)	1,117 (97.55)	11 (0.96)	564	8 (1.42)	552 (97.87)	4 (0.71)
WP Putrajaya	1,412	311 (22.03)	1,093 (77.41)	8 (0.57)	736	157 (21.33)	578 (78.53)	1 (0.14)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Ischaemic Heart Disease							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	10,660 (5.86)	167,790 (92.37)	3,184 (1.75)	88,457	4,989 (5.64)	81,966 (92.66)	1,502 (1.70)
Johor	35,055	3,442 (9.82)	31,064 (88.62)	549 (1.57)	7,415	782 (10.55)	6,569 (88.59)	64 (0.86)
Kedah	7,576	483 (6.38)	6,994 (92.32)	99 (1.31)	7,916	484 (6.11)	7,376 (93.18)	56 (0.71)
Kelantan	17,606	1,229 (6.98)	16,261 (92.36)	116 (0.66)	8,870	494 (5.57)	8,326 (93.87)	50 (0.56)
Melaka	11,818	561 (4.75)	11,234 (95.06)	23 (0.19)	12,528	575 (4.59)	11,835 (94.47)	118 (0.94)
N. Sembilan	16,893	687 (4.07)	16,147 (95.58)	59 (0.34)	5,158	204 (3.96)	4,937 (95.72)	17 (0.33)
Pahang	19,265	999 (5.19)	17,852 (92.67)	414 (2.15)	7,324	443 (6.05)	6,709 (91.60)	172 (2.35)
Perak	7,693	416 (5.45)	6,984 (90.78)	293 (3.81)	7,689	420 (5.46)	6,933 (90.17)	336 (4.37)
Perlis	800	38 (4.80)	762 (95.25)	0 (0.00)	850	42 (4.94)	808 (95.06)	0 (0.00)
P. Pinang	3,668	398 (10.85)	3,219 (87.76)	51 (1.39)	2,935	300 (10.22)	2,582 (87.97)	53 (1.81)
Sabah	12,560	385 (3.07)	12,079 (95.17)	96 (0.76)	6,534	188 (2.88)	6,277 (96.07)	69 (1.06)
Sarawak	18,340	404 (2.20)	17,218 (93.88)	718 (3.91)	2,886	54 (1.87)	2,715 (94.07)	117 (4.05)
Selangor	7,647	469 (6.13)	6,892 (90.13)	286 (3.74)	6,919	421 (6.08)	6,234 (90.10)	264 (3.82)
Terengganu	12,283	667 (5.43)	11,251 (91.60)	365 (2.97)	7,054	328 (4.65)	6,603 (93.61)	123 (1.74)
WP KL	7,873	393 (5.00)	7,375 (93.67)	105 (1.33)	3,079	210 (6.82)	2,809 (91.23)	60 (1.95)
WP Labuan	1,145	13 (1.14)	1,125 (98.25)	7 (0.61)	564	8 (1.42)	553 (98.05)	3 (0.53)
WP Putrajaya	1,412	76 (5.38)	1,333 (94.41)	3 (0.21)	736	36 (4.89)	700 (95.11)	0 (0.00)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Cerebrovascular Disease							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	3,248 (1.79)	175,207 (96.46)	3,179 (1.75)	88,457	1,665 (1.88)	85,302 (96.43)	1,490 (1.68)
Johor	35,055	811 (2.31)	33,658 (96.01)	586 (1.67)	7,415	203 (2.74)	7,144 (96.35)	68 (0.92)
Kedah	7,576	171 (2.26)	7,303 (86.67)	102 (2.50)	7,916	189 (2.39)	7,669 (96.88)	58 (0.73)
Kelantan	17,606	415 (2.36)	17,079 (97.01)	112 (0.64)	8,870	173 (1.95)	8,652 (97.54)	45 (0.51)
Melaka	11,818	88 (0.74)	11,706 (99.05)	24 (0.20)	12,528	101 (0.81)	12,306 (98.23)	121 (0.97)
N. Sembilan	16,893	227 (1.34)	16,613 (98.34)	53 (0.31)	5,158	95 (1.84)	5,046 (97.83)	17 (0.33)
Pahang	19,265	335 (1.74)	18,528 (96.17)	402 (2.09)	7,324	115 (1.57)	7,036 (96.07)	173 (2.36)
Perak	7,693	140 (1.82)	7,256 (94.29)	297 (3.89)	7,689	146 (1.90)	7,200 (93.64)	343 (4.46)
Perlis	800	12 (1.50)	788 (98.50)	0 (0.00)	850	30 (3.53)	819 (96.35)	1 (0.12)
P. Pinang	3,668	145 (3.95)	3,474 (94.71)	49 (1.34)	2,935	132 (4.50)	2,757 (93.94)	46 (1.57)
Sabah	12,560	182 (1.45)	12,281 (97.78)	97 (0.77)	6,534	100 (1.53)	6,366 (97.43)	68 (1.04)
Sarawak	18,340	150 (0.82)	17,504 (95.44)	686 (3.74)	2,886	22 (0.76)	2,759 (95.60)	105 (3.64)
Selangor	7,647	152 (1.99)	7,214 (94.34)	281 (3.67)	6,919	146 (2.11)	6,515 (94.16)	258 (3.73)
Terengganu	12,283	194 (1.35)	11,710 (95.34)	379 (3.09)	7,054	114 (1.62)	6,813 (96.58)	127 (1.80)
WP KL	7,873	180 (2.29)	7,592 (96.43)	101 (1.28)	3,079	73 (2.37)	2,949 (95.78)	57 (1.85)
WP Labuan	1,145	4 (0.35)	1,133 (98.95)	8 (0.70)	564	2 (0.35)	559 (99.11)	3 (0.53)
WP Putrajaya	1,412	42 (2.97)	1,368 (96.88)	2 (0.14)	736	24 (3.26)	712 (96.74)	0 (0.00)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Diabetic Foot Ulcer							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	2,230 (1.23)	176,578 (97.22)	2,826 (1.56)	88,457	1,094 (1.24)	86,034 (97.26)	1,329 (1.50)
Johor	35,055	585 (1.67)	33,908 (96.73)	562 (1.60)	7,415	140 (1.89)	7,209 (97.22)	66 (0.89)
Kedah	7,576	115 (1.52)	7,376 (97.36)	85 (1.12)	7,916	125 (1.58)	7,737 (97.74)	54 (0.68)
Kelantan	17,606	328 (1.86)	17,202 (97.71)	76 (0.43)	8,870	158 (1.78)	8,672 (97.77)	40 (0.45)
Melaka	11,818	120 (1.02)	11,677 (98.81)	21 (0.18)	12,528	110 (0.88)	12,299 (98.17)	119 (0.95)
N. Sembilan	16,893	146 (0.86)	16,695 (98.83)	52 (0.31)	5,158	40 (0.78)	5,103 (98.93)	15 (0.29)
Pahang	19,265	261 (1.35)	18,658 (96.85)	346 (1.80)	7,324	75 (1.02)	7,103 (96.98)	146 (1.99)
Perak	7,693	106 (1.39)	7,309 (95.01)	278 (3.61)	7,689	102 (1.33)	7,272 (94.58)	315 (4.10)
Perlis	800	20 (2.50)	780 (97.50)	0 (0.00)	850	19 (2.24)	830 (97.65)	1 (0.12)
P. Pinang	3,668	37 (1.01)	3,594 (97.98)	37 (1.01)	2,935	26 (0.89)	2,873 (97.89)	36 (1.23)
Sabah	12,560	89 (0.71)	12,396 (98.69)	75 (0.60)	6,534	55 (0.84)	6,422 (98.29)	57 (0.87)
Sarawak	18,340	105 (0.57)	17,647 (96.22)	588 (3.21)	2,886	19 (0.66)	2,779 (96.29)	88 (3.05)
Selangor	7,647	80 (1.05)	7,336 (95.93)	231 (3.02)	6,919	91 (1.32)	6,616 (95.62)	212 (3.06)
Terengganu	12,283	131 (1.07)	11,793 (96.01)	359 (2.92)	7,054	88 (1.25)	6,849 (97.09)	117 (1.66)
WP KL	7,873	79 (1.01)	7,689 (97.66)	105 (1.33)	3,079	35 (1.14)	2,984 (96.91)	60 (1.95)
WP Labuan	1,145	2 (0.17)	1,134 (99.04)	9 (0.79)	564	0 (0.00)	561 (99.47)	3 (0.53)
WP Putrajaya	1,412	26 (1.84)	1,384 (98.02)	2 (0.14)	736	11 (1.49)	725 (98.51)	0 (0.00)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities							
	Amputation							
	No. of patients audited	2019, n (%)			No. of patients audited	2020, n (%)		
		Yes	No	Unknown		Yes	No	Unknown
MALAYSIA	181,634	1,230 (0.68)	177,554 (97.75)	2,850 (1.57)	88,457	646 (0.73)	86,467 (97.75)	1,344 (1.52)
Johor	35,055	359 (1.02)	34,128 (97.36)	568 (1.62)	7,415	96 (1.29)	7,253 (97.82)	66 (0.89)
Kedah	7,576	64 (0.84)	7,428 (98.05)	84 (1.11)	7,916	61 (0.77)	7,808 (98.64)	47 (0.59)
Kelantan	17,606	121 (0.69)	17,407 (98.91)	78 (0.44)	8,870	47 (0.53)	8,782 (99.01)	41 (0.46)
Melaka	11,818	92 (0.78)	11,704 (99.04)	22 (0.19)	12,528	78 (0.62)	12,326 (98.39)	124 (0.99)
N. Sembilan	16,893	61 (0.36)	16,780 (99.33)	52 (0.31)	5,158	20 (0.39)	5,121 (99.28)	17 (0.33)
Pahang	19,265	116 (0.60)	18,794 (97.56)	355 (1.84)	7,324	37 (0.51)	7,138 (97.46)	149 (2.03)
Perak	7,693	81 (1.06)	7,341 (95.42)	271 (3.52)	7,689	86 (1.12)	7,290 (94.81)	313 (4.07)
Perlis	800	5 (0.63)	795 (99.38)	0 (0.00)	850	10 (1.18)	839 (98.71)	1 (0.12)
P. Pinang	3,668	34 (0.93)	3,594 (97.98)	40 (1.09)	2,935	22 (0.75)	2,875 (97.96)	38 (1.29)
Sabah	12,560	51 (0.42)	12,432 (98.89)	77 (0.61)	6,534	34 (0.52)	6,442 (98.59)	58 (0.89)
Sarawak	18,340	70 (0.38)	17,694 (96.48)	576 (3.14)	2,886	15 (0.52)	2,780 (96.33)	91 (3.15)
Selangor	7,647	47 (0.61)	7,361 (96.26)	239 (3.13)	6,919	57 (0.82)	6,651 (96.13)	211 (3.05)
Terengganu	12,283	64 (0.52)	11,848 (97.26)	371 (3.02)	7,054	56 (0.79)	6,877 (97.49)	121 (1.72)
WP KL	7,873	52 (0.66)	7,713 (97.97)	108 (1.37)	3,079	20 (0.65)	2,996 (97.30)	63 (2.05)
WP Labuan	1,145	3 (0.26)	1,135 (99.13)	7 (0.61)	564	1 (0.18)	560 (99.29)	3 (0.53)
WP Putrajaya	1,412	10 (0.71)	1,400 (99.15)	2 (0.14)	736	6 (0.82)	729 (99.05)	1 (0.14)

Table 5 - Complications and Comorbidities among Type 2 Diabetes Mellitus patients, 2019–2020, continued [Audit Dataset]

States	Comorbidities					
	Erectile Dysfunction					
	Total Male Tested / Total Male	2019, n (%)		Total Male Tested / Total Male	2020, n (%)	
		Abnormal	Normal		Abnormal	Normal
MALAYSIA	25,108/69,586	3,651 (14.54)	21,457 (85.46)	11,805/33,650	1,830 (15.50)	9,975 (84.50)
Johor	3,738/13,669	747 (19.98)	2,991 (80.02)	659/2,889	196 (29.74)	463 (70.26)
Kedah	1,147/2,790	168 (14.65)	979 (85.35)	848/2,850	150 (17.69)	698 (82.31)
Kelantan	3,383/5,854	330 (9.75)	3,053 (90.24)	1,905/2,883	139 (12.55)	1,666 (87.45)
Melaka	1,366/4,697	171 (12.52)	1,195 (87.48)	1,257/5,060	136 (10.82)	1,121 (89.18)
N. Sembilan	3,580/6,656	125 (3.49)	3,455 (96.51)	992/2,024	22 (2.22)	970 (97.78)
Pahang	2,863/7,448	872 (30.45)	1,991 (69.54)	1,526/2,813	409 (26.80)	1,117 (73.20)
Perak	1,031/2,924	210 (20.21)	821 (79.79)	987/2,906	208 (21.07)	779 (78.93)
Perlis	49/286	0 (0.00)	49 (100.00)	32/298	2 (6.25)	30 (93.75)
P. Pinang	578/1,532	137 (23.70)	441 (76.30)	402/1,228	104 (25.87)	298 (74.13)
Sabah	2,202/5,159	292 (13.26)	1,910 (86.73)	1,460/2,633	168 (11.51)	1,292 (88.49)
Sarawak	1,398/6,862	132 (12.94)	1,266 (87.06)	403/984	15 (3.27)	388 (96.28)
Selangor	640/3,099	102 (15.94)	538 (84.06)	383/2,763	95 (24.80)	288 (75.20)
Terengganu	1,604/4,258	28 (1.78)	1,576 (98.22)	994/2,369	75 (7.55)	919 (92.45)
WP KL	1,156/3,208	199 (17.21)	957 (82.78)	387/1,340	45 (11.63)	342 (88.37)
WP Labuan	58/441	5 (8.62)	53 (91.38)	170/228	0 (0.00)	170 (100.00)
WP Putrajaya	315/703	133 (42.22)	182 (57.78)	152/382	47 (30.92)	105 (69.08)

Clinical Findings

Overall, the proportion of patients receiving clinical investigations showed a mixed trend from 2019 to 2020. Table 6 shows the proportion of patients who had routine clinical tests performed.

The proportion of patients whose blood pressure (BP) was recorded remains at 95.98% in 2019 and 95.81% in 2020. The proportion of patients who had at least one HbA1c test done annually increased from 91.37% in 2019 to 92.07% in 2020. Other parameters related to blood glucose are shown in Table 6.

Blood creatinine examination for T2DM patients reduced from 86.95% in 2019 to 86.07% in 2020. Patients tested for total cholesterol has also reduced from 86.88% in 2019 to 86.27% in 2020. LDL-cholesterol investigations showed an increasing trend, from 67.09% in 2019 to 72.38% in 2020. Similarly, for HDL-cholesterol, the proportion has also increased from 67.55% in 2019 to 72.85% in 2020.

The proportion of patients tested for urine protein has reduced from 73.23% in 2019 to 72.65% in 2020. In 2019, 78.53% of patients had a foot examination and this proportion had reduced to 76.57% in 2020. In 2019, only 58.75% of patients had fundus examination and this proportion had reduced to 53.34% in 2020. In 2019, 61.17% of patients had an electrocardiogram (ECG) performed and the figure had reduced to 53.53% in 2020.

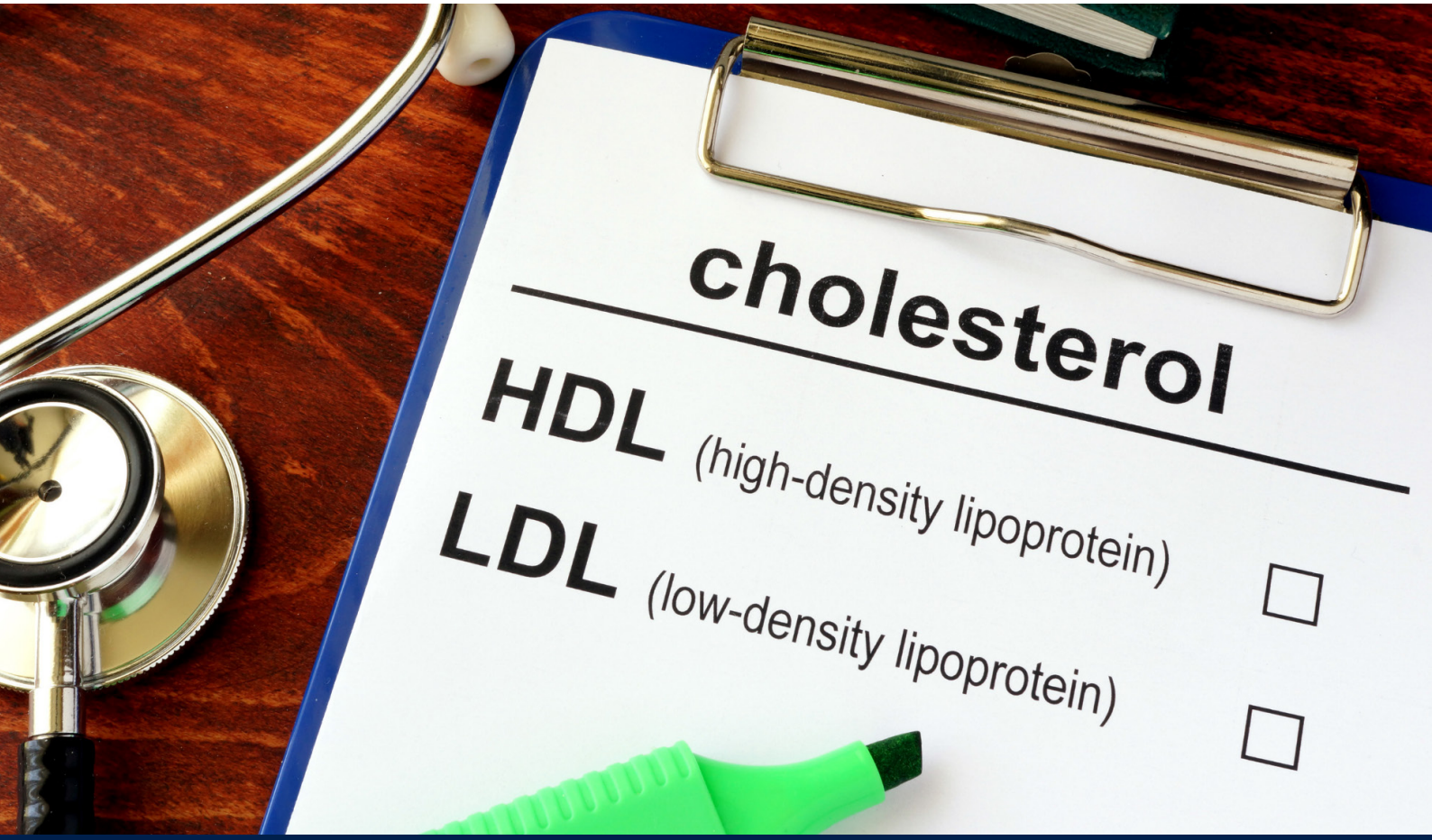

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020 [Audit Dataset]

States	Clinical Investigations											
	HbA_{1c}						Blood Pressure					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	165,962	91.37	88,457	81,440	92.07	181,634	174,340	95.98	88,457	84,754	95.81
Johor	35,055	31,894	90.98	7,415	6,733	90.80	35,055	33,795	96.40	7,415	7,162	96.86
Kedah	7,576	6,532	86.22	7,916	6,236	78.78	7,576	7,208	95.14	7,916	7,512	94.90
Kelantan	17,606	16,932	96.17	8,870	8,666	97.70	17,606	17,258	98.02	8,870	8,789	99.09
Melaka	11,818	11,382	96.31	12,528	11,564	92.31	11,818	11,376	96.25	12,528	11,514	91.91
N. Sembilan	16,893	15,542	92.00	5,158	4,692	90.97	16,893	15,775	93.38	5,158	4,805	93.16
Pahang	19,265	18,842	97.80	7,324	7,213	98.48	19,265	18,711	97.11	7,324	7,221	98.59
Perak	7,693	6,859	89.16	7,689	7,200	93.64	7,693	6,961	90.48	7,689	7,222	93.93
Perlis	800	772	96.50	850	816	96.00	800	795	99.37	850	836	98.35
P. Pinang	3,668	3,187	86.89	2,935	2,679	91.28	3,668	3,559	97.03	2,935	2,875	97.96
Sabah	12,560	10,725	85.39	6,534	5,954	91.12	12,560	11,770	93.71	6,534	6,164	94.34
Sarawak	18,340	14,176	77.30	2,886	2,437	84.44	18,340	17,450	95.14	2,886	2,748	95.22
Selangor	7,647	7,177	93.85	6,919	6,252	90.36	7,647	7,450	97.42	6,919	6,691	96.70
Terengganu	12,283	11,900	96.88	7,054	6,896	97.76	12,283	11,970	97.45	7,054	6,923	98.14
WP KL	7,873	7,502	95.29	3,079	2,826	91.78	7,873	7,696	97.75	3,079	2,980	96.78
WP Labuan	1,145	1,138	99.39	564	555	98.40	1,145	1,145	100.00	564	564	100.00
WP Putrajaya	1,412	1,402	99.29	736	721	97.96	1,412	1,403	99.36	736	728	90.91

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	Fasting Blood Glucose (FBG)						Random Blood Glucose (RBG)					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	109,887	60.50	88,457	49,166	55.58	181,634	109,689	60.39	88,457	59,270	67.00
Johor	35,055	22,385	63.86	7,415	4,330	58.40	35,055	18,384	52.44	7,415	4,076	54.97
Kedah	7,576	3,581	47.27	7,916	3,383	42.74	7,576	5,686	75.05	7,916	5,975	75.48
Kelantan	17,606	8,222	46.70	8,870	3,690	41.60	17,606	13,556	77.00	8,870	7,086	79.89
Melaka	11,818	8,018	67.85	12,528	6,727	53.70	11,818	9,454	80.00	12,528	9,656	77.08
N. Sembilan	16,893	7,101	42.04	5,158	2,123	41.16	16,893	12,929	76.53	5,158	3,954	76.66
Pahang	19,265	11,270	58.50	7,324	4,265	58.23	19,265	10,988	57.03	7,324	4,591	62.68
Perak	7,693	5,480	71.23	7,689	5,098	66.30	7,693	3,618	47.02	7,689	4,250	55.27
Perlis	800	689	86.13	850	699	82.24	800	653	81.62	850	716	84.24
P. Pinang	3,668	2,649	72.22	2,935	2,176	74.14	3,668	2,356	64.23	2,935	2,071	70.56
Sabah	12,560	9,532	75.89	6,534	4,868	74.50	12,560	3,667	29.20	6,534	2,118	32.42
Sarawak	18,340	12,175	66.38	2,886	1,970	68.26	18,340	6,221	33.92	2,886	1,186	41.09
Selangor	7,647	3,730	48.78	6,919	2,953	42.68	7,647	5,459	71.38	6,919	5,182	74.90
Terengganu	12,283	6,077	49.47	7,054	3,298	46.75	12,283	7,567	61.60	7,054	4,796	67.99
WP KL	7,873	6,548	83.17	3,079	2,354	76.45	7,873	6,635	84.28	3,079	2,400	77.95
WP Labuan	1,145	1,137	99.30	564	555	98.40	1,145	1,144	99.91	564	502	89.01
WP Putrajaya	1,412	1,293	91.57	736	677	91.98	1,412	1,372	97.16	736	711	96.60

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	2HPP						Creatinine					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	3,763	2.07	88,457	1,964	2.22	181,634	157,925	86.95	88,457	76,136	86.07
Johor	35,055	508	1.45	7,415	63	0.85	35,055	31,551	90.00	7,415	6,646	89.63
Kedah	7,576	85	1.12	7,916	97	1.23	7,576	6,414	84.66	7,916	6,127	77.40
Kelantan	17,606	673	3.82	8,870	285	3.21	17,606	16,283	92.49	8,870	8,438	95.13
Melaka	11,818	28	0.24	12,528	28	0.22	11,818	10,033	84.90	12,528	9,679	77.26
N. Sembilan	16,893	102	0.60	5,158	12	0.23	16,893	14,862	87.98	5,158	4,608	89.34
Pahang	19,265	37	0.19	7,324	30	0.41	19,265	17,401	90.32	7,324	6,907	94.31
Perak	7,693	182	2.37	7,689	51	0.66	7,693	6,454	83.89	7,689	6,870	89.35
Perlis	800	1	0.13	850	14	1.65	800	750	93.75	850	808	95.06
P. Pinang	3,668	18	0.49	2,935	32	1.09	3,668	3,254	88.71	2,935	2,641	89.98
Sabah	12,560	1,503	11.97	6,534	998	15.27	12,560	10,164	80.92	6,534	5,447	83.36
Sarawak	18,340	321	1.75	2,886	121	4.19	18,340	13,323	72.64	2,886	2,140	74.15
Selangor	7,647	88	1.15	6,919	132	1.91	7,647	6,635	86.77	6,919	5,387	77.86
Terengganu	12,283	53	0.43	7,054	30	0.43	12,283	11,653	94.87	7,054	6,819	96.67
WP KL	7,873	28	0.36	3,079	8	0.26	7,873	6,694	85.02	3,079	2,435	79.08
WP Labuan	1,145	0	0.00	564	4	0.71	1,145	1,128	98.52	564	532	94.33
WP Putrajaya	1,412	136	9.63	736	59	8.02	1,412	1,326	93.91	736	652	88.59

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	Total Cholesterol						LDL					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	157,807	86.88	88,457	76,267	86.27	181,634	121,867	67.09	88,457	64,026	72.38
Johor	35,055	31,592	90.12	7,415	6,702	90.38	35,055	29,031	82.82	7,415	6,545	88.27
Kedah	7,576	6,363	83.99	7,916	6,127	77.40	7,576	5,765	76.10	7,916	6,004	75.85
Kelantan	17,606	16,293	92.54	8,870	8,457	95.34	17,606	14,243	80.90	8,870	8,007	90.27
Melaka	11,818	9,927	84.00	12,528	9,625	76.83	11,818	1,139	9.64	12,528	2,511	20.04
N. Sembilan	16,893	14,878	88.07	5,158	4,576	88.72	16,893	10,864	64.31	5,158	4,467	86.60
Pahang	19,265	17,443	90.54	7,324	6,909	94.33	19,265	10,598	55.01	7,324	5,119	69.89
Perak	7,693	6,608	85.90	7,689	6,927	90.09	7,693	5,173	67.24	7,689	6,621	86.11
Perlis	800	762	95.25	850	810	95.29	800	735	91.88	850	807	94.94
P. Pinang	3,668	3,195	87.10	2,935	2,630	89.61	3,668	2,824	76.99	2,935	2,554	87.02
Sabah	12,560	9,858	78.49	6,534	5,485	83.95	12,560	5,817	46.31	6,534	4,202	64.31
Sarawak	18,340	13,529	73.77	2,886	2,210	76.58	18,340	9,879	53.87	2,886	1,731	59.98
Selangor	7,647	6,597	86.27	6,919	5,333	77.08	7,647	5,830	76.24	6,919	5,058	73.10
Terengganu	12,283	11,631	94.69	7,054	6,825	96.75	12,283	11,103	90.39	7,054	6,764	95.89
WP KL	7,873	6,644	84.39	3,079	2,428	78.86	7,873	6,634	84.26	3,079	2,422	78.66
WP Labuan	1,145	1,144	99.91	564	531	94.15	1,145	890	77.73	564	527	93.44
WP Putrajaya	1,412	1,343	95.11	736	692	94.02	1,412	1,342	95.04	736	687	93.34

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	HDL						Triglyceride					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	122,686	67.55	88,457	64,442	72.85	181,634	155,220	85.46	88,457	75,746	85.63
Johor	35,055	29,099	83.01	7,415	6,577	88.70	35,055	31,460	89.74	7,415	6,693	90.26
Kedah	7,576	5,712	75.40	7,916	6,051	76.44	7,576	6,204	81.89	7,916	6,114	77.24
Kelantan	17,606	14,602	82.94	8,870	8,167	92.07	17,606	16,008	90.92	8,870	8,353	94.17
Melaka	11,818	1,161	9.82	12,528	2,541	20.28	11,818	9,967	84.34	12,528	9,552	76.25
N. Sembilan	16,893	10,868	64.33	5,158	4,466	86.58	16,893	14,824	87.75	5,158	4,573	88.66
Pahang	19,265	10,664	55.35	7,324	5,135	70.11	19,265	16,909	87.77	7,324	6,908	94.32
Perak	7,693	5,165	67.14	7,689	6,626	86.18	7,693	6,433	83.62	7,689	6,870	89.35
Perlis	800	737	92.13	850	807	94.94	800	755	94.38	850	810	95.29
P. Pinang	3,668	2,848	77.64	2,935	2,561	87.26	3,668	3,193	87.05	2,935	2,628	89.54
Sabah	12,560	6,026	47.98	6,534	4,273	65.40	12,560	9,316	74.17	6,534	5,371	82.20
Sarawak	18,340	9,935	54.17	2,886	1,779	61.64	18,340	13,058	71.20	2,886	2,104	72.90
Selangor	7,647	5,770	75.45	6,919	5,046	72.93	7,647	6,471	84.62	6,919	5,318	76.86
Terengganu	12,283	11,222	91.36	7,054	6,778	96.09	12,283	11,540	93.95	7,054	6,823	96.73
WP KL	7,873	6,634	84.26	3,079	2,422	78.66	7,873	6,634	84.26	3,079	2,413	78.37
WP Labuan	1,145	901	78.69	564	522	92.55	1,145	1,104	96.42	564	525	93.09
WP Putrajaya	1,412	1,342	95.04	736	691	93.89	1,412	1,344	95.18	736	691	93.89

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	Urine Protein						Urine Microalbumin					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	133,010	73.23	88,457	64,266	72.65	181,634	95,064	52.34	88,457	47,131	53.28
Johor	35,055	24,372	69.53	7,415	5,281	71.22	35,055	16,450	46.93	7,415	3,226	43.51
Kedah	7,576	5,331	70.37	7,916	5,347	67.55	7,576	3,597	47.48	7,916	3,586	45.30
Kelantan	17,606	14,143	80.33	8,870	7,181	80.96	17,606	10,867	61.72	8,870	5,793	65.31
Melaka	11,818	8,177	69.19	12,528	7,019	56.03	11,818	6,089	51.52	12,528	4,905	39.15
N. Sembilan	16,893	13,323	78.87	5,158	4,250	82.40	16,893	8,040	47.59	5,158	2,357	45.70
Pahang	19,265	15,286	79.35	7,324	6,192	84.54	19,265	11,394	59.14	7,324	4,776	65.21
Perak	7,693	5,219	67.84	7,689	5,519	71.78	7,693	4,367	56.77	7,689	4,255	55.34
Perlis	800	545	68.13	850	693	81.53	800	342	42.75	850	542	63.76
P. Pinang	3,668	2,641	72.00	2,935	2,082	70.94	3,668	2,077	56.62	2,935	1,554	52.95
Sabah	12,560	8,768	69.81	6,534	5,043	77.18	12,560	5,623	44.77	6,534	3,136	48.00
Sarawak	18,340	10,781	58.78	2,886	1,903	65.94	18,340	6,416	34.98	2,886	1,401	48.54
Selangor	7,647	5,482	71.69	6,919	4,443	64.21	7,647	4,699	61.45	6,919	3,828	55.33
Terengganu	12,283	11,140	90.69	7,054	6,266	88.83	12,283	9,225	75.10	7,054	5,545	78.61
WP KL	7,873	5,396	68.54	3,079	1,993	64.73	7,873	4,163	52.88	3,079	1,190	38.65
WP Labuan	1,145	1,127	98.43	564	539	95.57	1,145	498	43.49	564	523	92.73
WP Putrajaya	1,412	1,279	90.58	736	515	69.97	1,412	1,217	86.19	736	514	69.84

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Clinical Investigations											
	Foot Examination						Fundus Examination					
	No. of patients audited	2019		No. of patients audited	2020		No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%		n	%		n	%
MALAYSIA	181,634	142,648	78.53	88,457	67,728	76.57	181,634	106,712	58.75	88,457	47,184	53.34
Johor	35,055	26,580	75.82	7,415	5,381	72.57	35,055	20,097	57.33	7,415	3,903	52.64
Kedah	7,576	5,551	73.27	7,916	5,937	75.00	7,576	3,839	50.67	7,916	3,202	40.45
Kelantan	17,606	14,374	81.64	8,870	7,537	84.97	17,606	13,188	74.91	8,870	5,777	65.13
Melaka	11,818	9,802	82.94	12,528	8,869	70.79	11,818	5,432	45.96	12,528	4,731	37.76
N. Sembilan	16,893	13,199	78.13	5,158	3,961	76.79	16,893	11,381	67.37	5,158	3,223	62.49
Pahang	19,265	17,599	91.35	7,324	6,735	91.96	19,265	10,793	56.02	7,324	4,219	57.61
Perak	7,693	5,587	72.62	7,689	5,523	71.83	7,693	4,053	52.68	7,689	3,853	50.11
Perlis	800	623	77.88	850	627	73.76	800	458	57.25	850	430	50.59
P. Pinang	3,668	2,936	80.04	2,935	2,420	82.45	3,668	2,421	66.00	2,935	2,024	68.96
Sabah	12,560	10,033	79.88	6,534	5,074	77.66	12,560	6,329	50.39	6,534	3,697	56.58
Sarawak	18,340	11,799	64.33	2,886	1,819	63.03	18,340	7,392	40.31	2,886	1,084	37.56
Selangor	7,647	5,422	70.90	6,919	4,417	63.84	7,647	4,174	54.58	6,919	2,885	41.70
Terengganu	12,283	11,193	91.12	7,054	6,595	93.49	12,283	9,912	80.70	7,054	5,653	80.14
WP KL	7,873	5,551	70.51	3,079	1,650	53.59	7,873	4,956	62.95	3,079	1,479	48.04
WP Labuan	1,145	1,138	99.39	564	559	99.11	1,145	1,047	91.44	564	523	92.73
WP Putrajaya	1,412	1,261	89.31	736	624	84.78	1,412	1,240	87.82	736	501	68.07

Table 6 - Proportion of Type 2 Diabetes Mellitus patients receiving clinical investigations, 2019-2020, continued [Audit Dataset]

States	Comorbidities					
	Erectile Dysfunction					
	No. of patients audited	2019		No. of patients audited	2020	
		n	%		n	%
MALAYSIA	181,634	111,113	61.17	88,457	47,350	53.53
Johor	35,055	24,025	68.54	7,415	4,815	64.94
Kedah	7,576	4,159	54.90	7,916	3,403	42.99
Kelantan	17,606	14,207	80.69	8,870	7,062	79.62
Melaka	11,818	4,573	38.70	12,528	3,473	27.72
N. Sembilan	16,893	12,480	73.88	5,158	3,632	70.41
Pahang	19,265	7,795	40.46	7,324	3,298	45.03
Perak	7,693	3,988	51.84	7,689	3,527	45.87
Perlis	800	459	57.38	850	436	51.29
P. Pinang	3,668	2,636	71.86	2,935	2,240	76.32
Sabah	12,560	7,436	59.20	6,534	4,032	61.71
Sarawak	18,340	8,450	46.07	2,886	1,526	52.88
Selangor	7,647	3,071	40.16	6,919	1,366	19.74
Terengganu	12,283	10,344	84.21	7,054	6,002	85.09
WP KL	7,873	5,241	66.57	3,079	1,519	49.33
WP Labuan	1,145	1,052	91.88	564	553	98.05
WP Putrajaya	1,412	1,197	84.77	736	466	63.32

Clinical Target Achievement

The quality of care of patients with diabetes in MOH KKs is monitored using the HbA_{1c} level as a proxy. The Quality Assurance (QA) indicator is measured as the proportion of T2DM patients with HbA_{1c} ≤6.5% and is set at the optimum achievable standard, 30%. Table 7 shows the proportion of T2DM patients achieving HbA_{1c} ≤6.5%, which has increased from 27.64% in 2019 to 30.70% in 2020.

However, there was a decreasing trend seen in several states such as Kedah, Sabah, WP Labuan and WP Putrajaya, which were compensated by other states that did well in improving their patients' glycaemic control. The variation between states over the years in terms of HbA_{1c} achievements must be interpreted with caution since the coverage of HbA_{1c} testing also greatly differs between states. Despite this, the dataset is still useful for each individual state to monitor the changing trends of HbA_{1c} achievements over time.

Table 8 shows the mean HbA_{1c} and the percentage of patients reaching clinical targets for HbA_{1c}. Mean HbA_{1c} showed a slight improvement, decreased from 7.9% in 2019 to 7.8% in 2020. Table 9 reports the proportions of audited patients achieving treatment targets and Table 10 reports the mean clinical test values. Among audited patients, the proportion of those achieving treatment targets for urine protein, systolic and diastolic pressure were decreasing in trend. Improvements were seen for total cholesterol and triglycerides. The remaining parameters (LDL, BMI and Waist Circumference) remain unchanged.

Table 7 – Proportion of Type 2 Diabetes Mellitus Patients Achieving HbA_{1c} ≤6.5%*, 2019-2020

State	% Achieved target (HbA_{1c} ≤6.5%) – QA Indicator	
	2019	2020
Malaysia	27.64	30.70
Johor	21.19	24.17
Kedah	24.80	23.23
Kelantan	26.89	29.65
Melaka	28.29	28.79
N. Sembilan	31.40	36.08
Pahang	34.19	38.82
Perak	29.46	31.80
Perlis	27.34	32.47
P. Pinang	28.64	34.02
Sabah	36.85	35.14
Sarawak	25.17	32.82
Selangor	28.19	28.00
Terengganu	28.30	32.06
WP. Kuala Lumpur	31.34	31.43
WP. Labuan	40.66	35.26
WP. Putrajaya	42.28	36.77

Note:
*The denominator for the percentage is the total number of sampled patients for the audited year.

Table 8 - Mean HbA_{1c} and patients achieving glycaemic targets*, 2019-2020 [Audit Dataset]

States	HbA_{1c}											
	2019						2020					
	Mean, % (95% CI)	≤ 6.5%	≤ 7.0%	≤ 8.0%	≥ 10.0%	No. of patients with HbA_{1c} test results	Mean, % (95% CI)	≤ 6.5%	≤ 7.0%	≤ 8.0%	≥ 10.0%	No. of patients with HbA_{1c} test results
MALAYSIA	7.90 (7.93 - 7.95)	53,797 (32.41)	68,484 (41.26)	100,257 (60.40)	28,292 (17.05)	165,978	7.80 (7.78 - 7.81)	27,971 (34.35)	35,621 (43.74)	51,339 (63.04)	12,175 (14.95)	81,440
Johor	8.20 (8.20 - 8.25)	8,106 (25.40)	11,020 (34.60)	17,366 (54.50)	6,565 (20.60)	31,841	8.10 (8.00 - 8.10)	1,883 (27.97)	2,557 (37.98)	3,909 (58.06)	1,238 (18.39)	6,733
Kedah	8.20 (8.14 - 8.25)	1,879 (28.80)	2,380 (36.50)	3,612 (55.40)	1,350 (20.70)	6,526	8.10 (8.02 - 8.13)	1,839 (29.49)	2,441 (39.14)	3,571 (57.26)	1,203 (19.29)	6,236
Kelantan	8.30 (8.26 - 8.33)	5,052 (29.80)	5,924 (35.00)	8,870 (52.40)	3,844 (22.70)	16,935	8.20 (8.11 - 8.20)	2,815 (32.48)	3,306 (38.15)	4,786 (55.23)	1,766 (20.38)	8,666
Melaka	7.80 (7.73 - 7.80	3,606 (31.70)	4,828 (42.40)	7,156 (62.90)	1,518 (13.30)	11,382	7.70 (7.64 - 7.70)	3,725 (32.21)	5,007 (43.30)	7,499 (64.85)	1,340 (11.59)	11,564
N. Sembilan	7.90 (7.82 - 7.89)	5,304 (34.10)	6,657 (42.80)	9,668 (62.20)	2,516 (16.20)	15,540	7.60 (7.53 - 7.64)	1,872 (39.90)	2,272 (48.42)	3,135 (66.82)	624 (13.30)	4,692
Pahang	7.90 (7.82 - 7.88)	6,614 (35.10)	8,092 (43.00)	11,483 (61.00)	3,087 (16.40)	18,823	7.60 (7.54 - 7.63)	2,847 (39.47)	3,447 (47.79)	4,816 (66.77)	912 (12.64)	7,213
Perak	7.90 (7.88 - 7.98)	2,427 (35.60)	2,907 (42.70)	4,114 (60.50)	1,237 (18.20)	6,804	7.80 (7.77 - 7.86)	2,568 (35.67)	3,162 (43.92)	4,474 (62.14)	1,140 (15.83)	7,200
Perlis	8.00 (7.84 - 8.15)	228 (30.10)	319 (41.80)	459 (60.20)	140 (18.40)	763	7.80 (7.70 - 7.98)	276 (33.82)	356 (43.63)	516 (63.24)	133 (16.30)	816

Note:
*The denominator for the percentage achieving target was the number of patients with HbA_{1c} test results. Good glycaemic control as defined by the Malaysian CPG on T2DM (2021)

Table 8 - Mean HbA_{1c} and patients achieving glycaemic targets*, 2019-2020, continued [Audit Dataset]

States	HbA_{1c}											
	2019						2020					
	Mean, % (95% CI)	≤ 6.5%	≤ 7.0%	≤ 8.0%	≥ 10.0%	No. of patients with HbA_{1c} test results	Mean, % (95% CI)	≤ 6.5%	≤ 7.0%	≤ 8.0%	≥ 10.0%	No. of patients with HbA_{1c} test results
P. Pinang	7.70 (7.67 - 7.80)	1,089 (34.30)	1,427 (44.80)	2,070 (65.00)	448 (14.10)	3,184	7.60 (7.48 - 7.62)	1,044 (38.97)	1,311 (48.94)	1,806 (67.41)	312 (11.65)	2,679
Sabah	7.50 (7.41 - 7.49)	4,503 (42.20)	5,590 (52.30)	7,540 70.50)	1,273 (11.90)	10,689	7.60 (7.55 - 7.65)	2,360 (39.64)	2,934 (49.28)	4,087 (68.64)	768 (12.90)	5,954
Sarawak	7.50 (7.49 - 7.56)	5,750 (40.70)	7,158 (50.60)	9,994 70.60)	1,593 (11.30)	14,148	7.40 (7.34 - 7.48)	1,064 (43.66)	1,285 (52.73)	1,730 (70.99)	261 (10.71)	2,437
Selangor	7.90 (7.86 - 7.95)	2,192 (30.60)	2,949 (41.20)	4,367 (61.00)	1,130 (15.80)	7,160	7.80 (7.73 - 7.83)	1,957 (31.30)	2,692 (43.06)	3,974 (63.56)	870 (13.92)	6,252
Terengganu	8.20 (8.15 - 8.23)	3,429 (28.80)	4,358 (36.60)	6,498 (54.60)	2,514 (21.10)	11,899	8.00 (7.92 - 8.02)	2,268 (32.89)	2,873 (41.66)	4,122 (59.77)	1,233 (17.88)	6,896
WP. Kuala Lumpur	7.60 (7.59 - 7.68)	2,465 (32.90)	3,399 (45.40)	5,009 (66.80)	846 (11.30)	7,495	7.50 (7.48 - 7.60)	969 (34.29)	1,312 (46.43)	1,949 (68.97)	281 (9.94)	2,826
WP. Labuan	7.30 (7.16 - 7.34)	489 (43.00)	617 (54.20)	844 (74.20)	81 (7.10)	1,138	7.30 (7.21 - 7.48)	213 (38.38)	296 (53.33)	421 (75.86)	48 (8.65)	555
WP. Putrajaya	7.30 (7.17 - 7.34)	597 (42.60)	754 (53.80)	1,052 (75.00)	117 (8.40)	1,402	7.30 (7.15 - 7.37)	271 (37.59)	370 (51.32)	544 (75.45)	46 (6.38)	721

Note:
*The denominator for the percentage achieving target was the number of patients with HbA_{1c} test results. Good glycaemic control as defined by the Malaysian CPG on T2DM (2021)

Table 9 - Target achievement based on clinical investigations, 2019-2020 [Audit Dataset]

Clinical Investigations						
Clinical Test	**Blood Pressure: Systolic**		**Blood Pressure: Diastolic**		**Blood Pressure**	
Treatment Target	≤135 mmHg		≤75 mmHg		≤135/75 mmHg	
	Percentage (%)					
	2019	2020	2019	2020	2019	2020
MALAYSIA	52.60	48.14	44.50	41.65	29.29	26.33
Johor	46.69	40.25	42.61	41.22	26.17	23.00
Kedah	52.15	46.86	45.20	40.14	30.34	25.20
Kelantan	55.72	51.75	45.59	42.84	31.89	28.51
Melaka	49.06	43.69	47.31	41.87	29.96	24.75
N. Sembilan	50.63	42.08	44.42	40.45	28.78	22.61
Pahang	52.33	52.84	43.58	43.38	29.30	28.73
Perak	51.27	48.24	47.11	44.78	30.52	28.80
Perlis	48.35	45.57	51.40	46.89	33.08	27.39
P. Pinang	51.14	50.05	49.18	46.47	31.97	30.26
Sabah	57.56	56.29	42.77	39.73	30.61	27.43
Sarawak	57.53	53.24	38.97	36.49	28.26	25.46
Selangor	53.73	46.38	45.77	42.34	31.39	26.57
Terengganu	57.01	52.07	40.88	38.06	29.16	24.86
WP KL	51.62	44.06	48.37	44.46	32.20	26.51
WP Labuan	64.72	62.06	57.03	53.37	41.75	37.94
WP Putrajaya	57.02	50.14	25.45	21.15	19.96	14.70
Clinical Test	**Urine Protein**		**Urine Microalbumin**		**Total Cholesterol**	
Treatment Target	Negative		Negative		<4.5 mmol/l	
	Percentage (%)					
	2019	2020	2019	2020	2019	2020
MALAYSIA	66.50	65.98	65.60	69.39	38.90	39.78
Johor	56.72	53.44	56.70	58.83	36.33	40.14
Kedah	76.18	74.64	71.27	75.32	33.65	33.56
Kelantan	71.48	71.46	76.62	77.77	30.24	32.64
Melaka	64.18	59.30	75.09	81.14	44.82	47.31
N. Sembilan	59.88	51.36	65.89	64.66	39.53	39.93
Pahang	64.10	69.75	58.24	61.82	38.19	38.88
Perak	74.67	67.75	68.49	69.92	41.09	40.43
Perlis	78.14	73.88	71.34	58.30	39.31	35.93
P. Pinang	72.13	65.18	64.00	70.72	52.32	44.94
Sabah	70.75	69.45	68.65	69.94	47.47	47.03
Sarawak	77.79	78.33	72.66	73.33	49.88	48.55
Selangor	75.43	71.40	72.09	66.46	39.39	42.87
Terengganu	75.66	73.44	67.59	68.47	24.86	26.58
WP KL	53.43	46.36	48.91	55.20	49.42	48.68
WP Labuan	42.77	45.64	79.12	83.94	37.50	41.24
WP Putrajaya	60.52	42.72	39.77	44.75	35.67	48.27

Table 9 - Target achievement based on clinical investigations, 2019-2020, continued [Audit Dataset]

Clinical Investigations								
Clinical Test	**TG**		**HDL**				**LDL**	
Treatment Target	≤1.7mmol/l		>1.2mmol/l (Male)		>1.0mmol/l (Female)		≤2.6 mmol/l	
	Percentage (%)							
	2019	2020	2019	2020	2019	2020	2019	2020
MALAYSIA	65.90	66.79	36.43	36.66	83.20	85.41	45.10	45.68
Johor	63.58	64.20	32.95	39.06	81.03	87.10	43.32	48.52
Kedah	62.32	62.61	37.72	39.48	83.82	87.86	40.34	42.21
Kelantan	64.55	66.50	40.47	38.45	84.86	86.48	40.14	40.80
Melaka	70.08	68.93	32.41	34.92	81.76	85.32	32.22	49.78
N. Sembilan	68.40	70.85	36.15	32.75	83.32	83.55	47.44	45.89
Pahang	69.64	70.10	43.17	42.00	88.50	89.13	43.96	46.09
Perak	65.63	65.35	37.34	35.10	81.80	81.80	48.11	47.74
Perlis	70.51	65.19	28.17	37.94	71.70	82.67	44.70	42.63
P. Pinang	68.46	69.41	35.59	29.53	85.04	83.09	62.91	51.80
Sabah	67.55	65.77	39.84	36.15	84.20	85.85	56.36	53.66
Sarawak	60.77	58.04	45.02	38.76	83.20	84.17	61.98	60.50
Selangor	64.29	65.80	29.93	33.90	79.28	82.32	43.75	49.23
Terengganu	66.38	67.27	37.76	39.48	86.69	87.63	26.97	29.66
WP KL	68.86	71.20	30.60	29.70	81.51	79.35	57.90	55.90
WP Labuan	71.38	71.62	28.11	30.99	84.19	83.82	42.13	44.40
WP Putrajaya	67.56	67.58	29.90	33.99	84.25	85.07	43.96	57.50

Clinical Test	**BMI**		**Waist circumference**			
Treatment Target	<23kg/m²		<90cm (Male)		<80cm (Female)	
	Percentage (%)					
	2019	2020	2019	2020	2019	2020
MALAYSIA	15.97	15.78	30.31	30.39	12.20	12.18
Johor	16.49	16.21	28.95	27.55	11.97	10.53
Kedah	17.92	16.35	41.15	39.03	16.32	14.54
Kelantan	18.75	18.64	39.71	40.52	18.37	18.54
Melaka	13.66	13.17	28.46	25.97	10.58	9.18
N. Sembilan	15.32	14.00	24.23	22.04	7.85	6.51
Pahang	14.55	14.81	30.14	33.33	11.69	12.76
Perak	18.69	19.19	31.88	33.07	15.89	15.09
Perlis	15.01	16.67	35.20	35.58	9.24	7.11
P. Pinang	22.00	22.65	27.61	26.75	10.40	10.63
Sabah	15.26	15.16	29.55	30.21	12.22	11.96
Sarawak	15.60	14.39	32.53	33.39	12.63	17.28
Selangor	15.36	14.95	27.42	25.35	9.68	9.96
Terengganu	14.31	14.07	37.87	34.53	12.76	12.24
WP KL	16.14	16.83	24.35	23.80	7.84	8.47
WP Labuan	13.81	13.17	23.83	17.49	8.60	4.83
WP Putrajaya	9.12	6.76	16.34	16.05	6.01	6.64

Table 10 - Target achievements (Mean Values) based on clinical investigations [Audit Dataset]

Clinical Test	2019	2020
Blood Pressure: Systolic (mmHg)	135.4	136.9
Blood Pressure: Diastolic (mmHg)	76.9	77.6
Total Cholesterol (mmol/l)	4.9	4.9
TG (mmol/l)	1.7	1.7
HDL (Male) (mmol/l)	1.2	1.2
HDL (Female) (mmol/l)	1.4	1.4
LDL (mmol/l)	2.9	2.9
BMI (kg/m^2)	27.8	27.9
Waist circumference (Male) (cm)	95.2	95.3
Waist circumference (Female) (cm)	92.1	92.3

Drug Treatment

The use of anti-diabetic drugs is shown in Table 11. In 2020, 29.02% of patients were on monotherapy compared to 28.94% in 2019. Those on 2 or more OADs remain unchanged, 35.55% in 2020 and 35.11% in 2019. Patients who were on insulin - OAD combination treatment had increased from 23.73% in 2019 to 24.12% in 2020. The proportion of patients on diet management only reduced slightly from 5.59% to 5.41%.

In 2020, metformin (84.3%) was the most prescribed OADs followed by sulphonylureas (44.6%). These are followed by alpha-glucosidase inhibitors (0.96%) and glitazones (0.66%). The use of insulin remains almost the same, 30.36% in 2019 and 30.02% in 2020.

The use of other concomitant drugs is shown in Tables 12, 13 and 14. From 2019 to 2020, calcium channel blockers (56.50%) and ACE-inhibitors (53.23%) were the most commonly used anti-hypertensives, followed by beta-blockers (24.75%). Aspirin was the most commonly used anti-platelet (18.08%) and statins (81.96%) were the most commonly used lipid-lowering agents.

Table 11 – Utilization of anti-diabetic drugs, 2019-2020 [Audit Dataset]

States	Anti-diabetic drugs used (Therapy)															
	Monotherapy (OAD)				≥2 OAD				OAD + Insulin				Diet Only			
	2019		2020		2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	52,490	28.94	25,666	29.02	63,682	35.11	31,441	35.55	43,031	23.73	21,334	24.12	10,134	5.59	4,781	5.41
Johor	10,213	29.18	2,175	29.34	11,889	33.97	2,576	34.75	7,910	22.60	1,688	22.77	1,798	5.14	324	4.37
Kedah	1,967	25.99	2,107	26.62	2,859	37.78	2,970	37.52	1,957	25.86	1,978	24.99	354	4.68	370	4.67
Kelantan	4,002	22.73	2,129	24.00	6,024	34.22	3,130	35.29	5,054	28.71	2,505	28.24	629	3.57	240	2.71
Melaka	4,122	34.89	4,184	33.40	3,541	29.97	3,620	28.90	2,555	21.63	2,583	20.62	926	7.84	1,486	11.86
N. Sembilan	4,770	28.25	1,568	30.40	5,289	31.32	1,656	32.11	4,129	24.45	1,129	21.89	1,494	8.85	488	9.46
Pahang	4,927	25.60	2,022	27.62	7,346	38.17	2,906	39.69	4,831	25.10	1,799	24.57	911	4.73	198	2.70
Perak	2,172	28.47	2,256	29.35	2,794	36.62	2,863	37.24	1,537	20.14	1,712	22.27	744	9.75	437	5.68
Perlis	239	30.21	276	32.47	291	36.79	292	34.35	201	25.41	222	26.12	16	2.02	23	2.71
P. Pinang	1,073	29.28	872	29.71	1,523	41.57	1,208	41.16	764	20.85	641	21.84	169	4.61	114	3.88
Sabah	4,069	32.51	2,120	32.48	4,701	37.56	2,498	38.27	2,337	18.67	1,368	20.94	913	7.29	367	5.62
Sarawak	6,924	37.81	1,052	36.49	6,363	34.74	1,170	40.58	3,357	18.33	458	15.89	1,126	6.15	136	4.72
Selangor	1,894	24.83	1,833	26.49	2,908	38.13	2,482	35.87	2,131	27.94	1,995	28.83	290	3.80	222	3.21
Terengganu	3,111	25.32	1,797	25.47	4,149	33.77	2,414	34.22	3,553	28.92	2,109	29.90	476	3.87	221	3.13
WP KL	2,097	26.68	833	27.05	2,976	37.87	1,144	37.15	2,189	27.85	857	27.83	249	3.17	130	4.22
WP Labuan	448	39.13	231	40.96	478	41.75	214	37.94	194	16.94	102	18.09	16	1.40	11	1.95
WP Putrajaya	462	32.72	211	28.67	551	39.02	298	40.49	332	23.51	188	25.54	23	1.63	14	1.90

Table 11 – Utilization of anti-diabetic drugs, 2019-2020, continued [Audit Dataset]

States	Anti-diabetic drugs used (Therapy)															
	Metformin				Sulphonylureas				α-Glucosidase Inhibitors				Meglitinides			
	2019		2020		2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	150,570	83.02	74,557	84.30	80,395	44.33	39,444	44.60	2,571	1.42	852	0.96	167	0.09	113	0.13
Johor	28,232	80.67	6,127	82.64	14,620	41.77	3,117	42.04	328	0.94	51	0.69	9	0.03	3	0.04
Kedah	6,427	84.93	6,634	83.80	3,597	47.54	3,778	47.73	114	1.51	62	0.78	1	0.01	6	0.08
Kelantan	13,815	78.47	7,221	81.41	7,999	45.44	4,109	46.32	604	3.43	190	2.14	28	0.16	2	0.02
Melaka	9,669	81.84	9,865	78.74	4,578	38.75	4,665	37.24	54	0.46	33	0.26	3	0.03	5	0.04
N. Sembilan	13,480	79.83	4,164	80.73	6,778	40.14	2,054	39.82	55	0.33	4	0.08	4	0.02	0	0.00
Pahang	16,305	84.73	6,421	87.69	8,996	46.75	3,481	47.54	442	2.30	175	2.39	17	0.09	17	0.23
Perak	6,169	80.85	6,505	84.62	3,315	43.45	3,510	45.66	170	2.23	121	1.57	14	0.18	18	0.23
Perlis	711	89.89	762	89.65	337	42.60	337	39.65	1	0.13	0	0.00	0	0.00	0	0.00
P. Pinang	3,196	87.23	2,567	87.46	1,913	52.21	1,506	51.31	9	0.25	5	0.17	0	0.00	0	0.00
Sabah	10,618	84.83	5,731	87.79	5,507	44.00	2,997	45.91	319	2.55	91	1.38	20	0.16	53	0.81
Sarawak	15,781	86.16	2,589	89.80	8,136	44.42	1,336	46.34	217	1.18	27	0.94	16	0.09	1	0.03
Selangor	6,648	87.16	6,088	87.99	3,857	50.57	3,275	47.33	30	0.39	16	0.23	6	0.08	3	0.04
Terengganu	10,202	83.04	5,959	84.48	5,546	45.14	3,167	44.90	198	1.61	64	0.91	49	0.40	3	0.04
WP KL	6,942	88.33	2,725	88.50	3,943	50.17	1,476	47.94	25	0.32	13	0.42	0	0.00	1	0.03
WP Labuan	1,095	95.63	531	94.15	585	51.09	264	46.81	4	0.35	0	0.00	0	0.00	0	0.00
WP Putrajaya	1,280	90.65	668	90.76	688	48.73	372	50.54	1	0.07	0	0.00	0	0.00	1	0.14

Table 11 – Utilization of anti-diabetic drugs, 2019-2020, continued [Audit Dataset]

States	Anti-diabetic drugs used (Therapy)											
	Glitazones				Other OAD				Insulin			
	2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	1,334	0.80	582	0.66	3,208	1.77	1,828	2.07	55,055	30.36	26,555	30.02
Johor	279	0.80	65	0.88	461	1.32	73	0.98	11,099	31.71	2,339	31.55
Kedah	10	0.13	11	0.14	150	1.98	192	2.43	2,387	31.60	2,469	31.19
Kelantan	115	0.65	23	0.26	651	3.70	302	3.40	6,950	39.48	3,371	38.00
Melaka	104	0.88	91	0.73	118	1.00	120	0.96	3,226	27.30	3,238	25.85
N. Sembilan	44	0.26	19	0.37	175	1.04	28	0.54	5,333	31.58	1,446	28.03
Pahang	170	0.88	64	0.87	260	1.35	141	1.93	6,060	31.49	2,196	29.99
Perak	206	2.70	116	1.51	79	1.04	155	2.02	1,920	25.16	2,131	27.72
Perlis	0	0.00	0	0.00	6	0.76	10	1.18	245	30.80	259	30.47
P. Pinang	2	0.05	1	0.03	95	2.59	115	3.92	899	24.54	741	25.25
Sabah	94	0.75	28	0.43	454	3.63	308	4.72	2,834	22.64	1,543	23.64
Sarawak	284	1.55	70	2.43	312	1.70	79	2.74	3,902	21.30	525	18.21
Selangor	7	0.09	15	0.22	92	1.21	82	1.19	2,535	33.24	2,382	34.43
Terengganu	15	0.12	73	1.03	201	1.64	121	1.72	4,549	37.03	2,622	37.17
WP KL	3	0.04	3	0.10	97	1.23	68	2.21	2,537	32.28	972	31.57
WP Labuan	0	0.00	2	0.35	1	0.09	0	0.00	203	17.60	108	19.15
WP Putrajaya	1	0.07	1	0.14	56	3.97	34	4.62	376	26.63	213	28.94

Table 12 – Utilization of concomitant drugs, Anti-Hypertensive, 2019-2020 [Audit Dataset]

States	Use of concomitant drugs (Anti-Hypertensives)															
	ACE inhibitors				Angiotensin receptor blocker				Beta blockers				Calcium channel blockers			
	2019		2020		2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	90,532	51.80	47,073	53.23	13,262	7.80	7,691	8.70	42,449	25.00	21,887	24.75	98,539	57.70	49,965	56.50
Johor	17,275	49.36	3,806	51.34	1,726	4.93	455	6.14	9,123	26.07	2,008	27.09	21,155	60.45	4,545	61.33
Kedah	3,700	48.90	4,023	50.83	472	6.24	592	7.48	1,586	20.96	1,806	22.82	4,006	52.95	4,338	54.81
Kelantan	9,927	56.39	5,056	57.00	1,383	8.68	798	9.00	4,125	25.89	2,279	25.69	8,859	55.59	5,085	57.33
Melaka	6,107	51.69	6,414	51.20	737	6.24	781	6.23	3,246	27.48	3,131	24.99	6,071	56.58	6,215	49.61
N. Sembilan	8,742	51.77	2,626	50.91	1,103	6.53	406	7.87	4,176	24.73	1,288	24.97	9,746	57.72	3,009	58.34
Pahang	10,796	56.10	4,110	56.13	1,283	6.67	602	8.22	4,431	23.03	1,677	22.90	10,887	56.5	4,218	57.61
Perak	3,738	48.99	4,021	52.30	604	7.92	751	9.77	1,946	25.51	2,005	26.08	3,817	50.04	4,002	52.06
Perlis	424	53.60	435	51.18	39	4.93	57	6.71	213	26.93	201	23.65	442	55.88	497	58.47
P. Pinang	2,016	55.02	1,604	54.67	316	8.62	313	10.67	1,066	29.09	800	27.27	2,046	55.84	1,639	55.86
Sabah	4,713	48.38	3,030	46.39	1,365	11.40	815	12.48	2,186	22.44	1,602	24.53	6,034	61.95	3,987	61.05
Sarawak	6,414	46.25	1,340	46.46	1,431	10.32	264	9.15	3,718	26.82	767	26.60	9,025	64.95	1,876	65.05
Selangor	4,632	60.73	4,207	60.81	570	7.47	534	7.72	2,026	26.56	1,818	26.28	4,445	58.28	4,082	59.01
Terengganu	6,452	58.39	4,062	57.60	1,112	10.40	775	10.99	2,184	19.76	1,462	20.73	6,158	55.73	4,036	57.23
WP KL	4,444	56.55	1,784	57.94	693	8.82	315	10.23	2,048	26.06	827	26.86	4,401	56.00	1,739	56.48
WP Labuan	407	35.55	192	34.04	196	17.12	88	15.60	147	12.84	84	14.89	795	69.43	363	64.36
WP Putrajaya	745	52.76	363	49.32	232	16.43	145	19.70	228	16.15	132	17.93	652	46.18	334	45.38

Table 12 – Utilization of concomitant drugs, Anti-Hypertensive, 2019-2020, continued [Audit Dataset]

States	Use of concomitant drugs (Anti-Hypertensives)															
	Diuretics				Alpha blockers				Central-acting agents				Others			
	2019		2020		2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	35,153	20.30	18,176	20.55	6,935	4.05	3,391	3.83	304	0.10	144	0.16	774	0.50	431	0.49
Johor	6,382	18.24	1,470	19.84	2,174	6.21	416	5.61	69	0.20	12	0.16	141	0.40	45	0.61
Kedah	1,641	21.69	1,620	20.47	205	2.71	216	2.73	12	0.16	5	0.06	53	0.70	36	0.45
Kelantan	4,101	25.74	2,227	25.11	504	3.16	290	3.27	21	0.13	4	0.05	141	0.88	47	0.53
Melaka	2,135	18.17	2,107	16.82	579	4.90	578	4.61	10	0.08	11	0.09	19	0.16	12	0.10
N. Sembilan	3,176	18.81	900	17.45	931	5.51	254	4.92	9	0.05	1	0.02	55	0.33	20	0.39
Pahang	4,191	21.78	1,576	21.52	445	2.31	198	2.70	15	0.08	12	0.16	41	0.21	14	0.19
Perak	1,448	18.98	1,564	20.34	237	3.11	344	4.47	63	0.83	22	0.29	18	0.24	39	0.51
Perlis	183	23.14	190	22.35	25	3.16	30	3.53	1	0.13	0	0.00	1	0.13	1	0.12
P. Pinang	748	20.41	583	19.87	123	3.36	107	3.65	5	0.14	2	0.07	23	0.63	23	0.78
Sabah	1,959	20.11	1,291	19.77	340	3.49	187	2.86	27	0.28	29	0.44	160	1.64	103	1.58
Sarawak	2,563	18.49	512	17.75	421	3.04	81	2.81	26	0.19	1	0.03	59	0.43	44	1.53
Selangor	1,753	22.98	1,491	21.55	329	4.31	311	4.50	18	0.24	34	0.49	12	0.16	20	0.29
Terengganu	2,958	26.69	1,876	26.60	293	2.65	223	3.16	1	0.01	4	0.06	41	0.37	18	0.26
WP KL	1,509	19.20	572	18.58	288	3.66	133	4.32	25	0.32	4	0.13	5	0.06	5	0.16
WP Labuan	249	21.75	107	18.97	7	0.61	5	0.89	0	0.00	1	0.18	1	0.09	3	0.53
WP Putrajaya	157	11.12	90	12.23	34	2.41	18	2.45	2	0.14	2	0.27	4	0.28	1	0.14

Table 13 - Utilization of concomitant drugs, Anti-Platelet, 2019-2020 [Audit Dataset]

Use of concomitant drugs (Anti-Platelet)								
States	Acetyl Salicylic Acid				Ticlopidine			
	2019		2020		2019		2020	
	n	%	n	%	n	%	n	%
MALAYSIA	32,999	19.27	15,986	18.08	1,009	0.59	439	0.50
Johor	8,046	22.99	1,596	21.54	215	0.61	22	0.30
Kedah	1,452	19.19	1,465	18.51	62	0.82	60	0.76
Kelantan	2,439	15.31	1,277	14.40	35	0.22	45	0.51
Melaka	2,190	18.54	2,091	16.69	29	0.25	31	0.25
N. Sembilan	3,360	19.90	882	17.10	230	1.36	61	1.18
Pahang	4,205	21.85	1,666	22.76	164	0.85	50	0.68
Perak	1,762	23.10	1,750	22.75	56	0.73	63	0.82
Perlis	121	15.30	147	17.29	3	0.38	0	0.00
P. Pinang	871	23.77	672	22.90	43	1.17	26	0.89
Sabah	1,501	15.41	889	13.62	32	0.33	10	0.15
Sarawak	1,847	13.32	339	11.76	33	0.24	5	0.17
Selangor	1,502	19.69	1,227	17.74	42	0.55	29	0.42
Terengganu	1,915	17.33	1,247	17.68	16	0.14	16	0.23
WP KL	1,558	19.82	610	19.81	41	0.52	18	0.58
WP Labuan	57	4.98	38	6.74	0	0.00	1	0.18
WP Putrajaya	173	12.25	90	12.23	8	0.57	2	0.27

Table 14 - Utilization of concomitant drugs, Anti-Lipid, 2019-2020 [Audit Dataset]

States	Use of concomitant drugs (Anti-Lipid)											
	Statins				Fibrates				Others			
	2019		2020		2019		2020		2019		2020	
	n	%	n	%	n	%	n	%	n	%	n	%
MALAYSIA	144,602	79.70	72,478	81.96	3,329	1.80	1,358	1.54	324	0.20	143	0.16
Johor	28,449	81.29	6,262	84.50	688	1.97	107	1.44	30	0.09	13	0.18
Kedah	6,009	79.42	6,579	83.12	318	4.20	275	3.47	6	0.08	15	0.19
Kelantan	14,851	84.40	7,583	85.49	130	0.70	62	0.70	50	0.30	15	0.17
Melaka	8,450	71.53	8,904	71.07	186	1.57	180	1.44	31	0.26	17	0.14
N. Sembilan	12,791	75.75	3,879	75.20	374	2.21	110	2.13	16	0.09	3	0.06
Pahang	15,036	78.14	5,968	81.53	433	2.25	115	1.57	13	0.07	3	0.04
Perak	5,813	76.19	6,345	82.54	101	1.32	103	1.34	14	0.18	20	0.26
Perlis	693	87.61	759	89.29	51	6.45	40	4.71	1	0.13	4	0.47
P. Pinang	3,131	85.45	2,544	86.71	104	2.84	97	3.31	18	0.49	15	0.51
Sabah	9,400	75.10	5,352	82.01	247	1.90	67	1.03	25	0.20	6	0.09
Sarawak	14,034	76.60	2,330	80.82	256	1.15	31	1.08	54	0.30	7	0.24
Selangor	6,542	85.77	6,000	86.73	86	1.13	40	0.58	8	0.10	19	0.27
Terengganu	10,504	85.10	6,181	87.65	108	0.90	56	0.79	44	0.40	4	0.06
WP KL	6,740	85.76	2,704	87.82	208	2.65	61	1.98	10	0.13	2	0.06
WP Labuan	977	85.33	464	82.27	5	0.44	0	0.00	0	0.00	0	0.00
WP Putrajaya	1,182	83.71	624	84.78	34	2.41	14	1.90	4	0.28	0	0.00

Summary and Conclusion

There are several key features that we wish to highlight in this report.

From the National Health and Morbidity Survey 2019, it was estimated that approximately 1,999,450 people in Malaysia are known diabetes and 68.2% of patients with known diabetes are on follow-up at MOH KKs. Therefore, it is estimated that approximately 1,363,625 patients seek care at MOH KKs. In the NDR, for the assessment year ending in 2020, there were 902,991 active diabetes patients, which means only 66.2% of diagnosed patients who claim to seek treatment at MOH primary care facilities are on active follow up. As in the previous years, this number remains sub-optimal.

For the year 2020, due to disruptions of COVID-19, the total number of samples for the audit was reduced to almost half as compared to the total samples in 2019. However, the sample size remains representative of the patient care in the different states. The total number of tests conducted to screen for complications has also reduced for year 2020.

Since the methodology of the Diabetes Clinical Audit is heavily dependent on the quality of documentation of the patients' case notes, more emphasis should be placed on continuously improving documentation by all healthcare providers providing care to patients with diabetes, regardless of level of care. Data accuracy on diabetes-related complications in the NDR should be improved further to reduce "unknown" records.

The NDR dataset is a useful tool for monitoring quality of care for people living with T2DM in MOH health clinics, despite some limitations in the dataset. In 2020, Malaysia successfully achieved the target for the QA indicator, the first time since its introduction. However, reduction was seen in the rate of screening for complications in 2020, which should be addressed moving forward. It is hoped that with the publication of this information, further action can be taken to ensure good quality of care among diabetes patients.

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