A Population-based Cross-sectional Study of the Status of Diabetes Care in the Philippines (PhilDiabCare 2020)

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Abstract

Background. Worldwide, diabetes mellitus (DM) is a serious health issue with a global prevalence of 9.8% in 2021. According to the latest 2018 Expanded National Health and Nutrition survey done by the DOST-FNRI, the prevalence of diabetes in the Philippines have more than doubled from 3.4% in 2003 to 7.9% in 2018. The latest research conducted regarding diabetes care in the Philippines was in 2008 which showed that 85% of patients with diabetes failed to achieve the HbA1c general target of <7%.

Objectives. A population-based cross-sectional study to update the current status of diabetes care in the Philippines, specifically to determine glycemic control, trends in DM management, prevalence of complications and lastly their clinico-socio demographic profile.

Methods. 340 patients with diabetes were included from the clinics of the Institute for Studies on Diabetes Foundation, Inc. physicians. The following data were collected: clinico-socio demographic profile, HbA1**c-**based glycemic control, trend in the use of glucose lowering agents, and prevalence of diabetes complications.

Results. The mean age of the 340 patients with diabetes in this study was 62 years old. Almost sixty-seven percent (66.8%) were females. The mean body mass index was 26 kg/m^2. The mean duration of diabetes was 12.63 years. Close to sixty-eight percent (67.6%) had tertiary education, 58.8% were unemployed and 65% had above minimum income.

The most commonly used single oral agent was biguanide (72.9%), followed by dipeptidyl peptidase-4 inhibitors (64.3%). The most common dual therapy combinations were biguanide plus dipeptidyl peptidase-4 inhibitors (43.2%), biguanide plus sulfonylureas (27.2%), and biguanide plus sodium-glucose co-transporter-2 inhibitors (11.1%). Basal insulin was the most commonly used injectable agent.

The present study showed that 47.4% of patients achieved an HbA1c of <7%. For the microvascular complication group alone, most had neuropathy (30.4%) followed by nephropathy (17.3%) and by retinopathy (5.4%). For the macrovascular complication group, the most common was coronary artery disease (82%) followed by peripheral artery disease and DM foot (27%). Overall, the most frequent DM complication identified was neuropathy (30.4%) , nephropathy (17.3%) and coronary heart disease (16.1%).

Discussion. Compared to the 2008 study, oral glucose lowering agents' usage shifted from sulfonylureas to more use of dipeptidyl peptidase-4 inhibitors. There was a decline in the use of thiazolidinediones, α-glucosidase inhibitors and non-use of meglitinides. For insulin use, there was a shift from the use of premixed insulin to more basal insulin usage.

There was marked improvement in the diabetes care situation in the Philippines from the 2008 study to the 2020 study. Glycemic control defined as HbA1c level of <7.0 increased from 15% to 47.4%. Coronary artery disease was the most common macrovascular complication while neuropathy was the most common overall and microvascular complication.

Keywords: HbA1c, Diabetes Complications, PhilDiabCare, Glycemic Control, T2DM, Comorbidities, Management

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Introduction

Worldwide, diabetes mellitus (DM) is a serious health issue with a global prevalence of 9.8% in 2021. More than 537 million people in the world struggle to live daily with diabetes.[1] In the Philippines, diabetes was reported as the fourth most common cause of death among Filipinos in 2020.[2] This makes the Philippines one of the world's emerging diabetes hotspots ranking 15th in the world for diabetes prevalence.[3] The National Health and Nutrition survey clearly showed an increasing trend from 3.9% in 1998, 4.8% in 2008, 5.6% in 2013, to 7.9% in 2018.[4]

Based on DiabCare 2008[5], 85% of individuals with diabetes in the Philippines failed to achieve the American Diabetes Association (ADA) recommended general HbA1c of <7% for good glycemic control. This makes the country the worst in the Asia Pacific region in terms of diabetes control. In the Diabcare 2008[5] study, microvascular, macrovascular, and severe late complications were reported as 68.1%, 14.8%, and 9.4% respectively. Specifically, the complications noted were neuropathy (45.2%), cataract (32.7%), microalbuminuria (15.8%), history of angina pectoris (10.7%), and cerebral stroke (4.7%). After 2008, there was a paucity of studies on the status of diabetes care in the Philippines.

The purpose of this population-based cross-sectional study is to update the current status of diabetes care in the Philippines, to determine the prevalence of micro- and macrovascular complications and to describe the clinico-socio demographic profiles.

Methodology

Study design. This is a population-based cross-sectional study on the current status of diabetes care in the Philippines. This study was conducted in compliance with guidelines and recommendations for good epidemiological practice for non-interventional studies and international and local guidelines such as the Philippines Health Research Ethics Board 2017 Guidelines of the Conduct of Research on Human Participants and the International Conference on Harmonization Good Clinical Practice Guidelines, and the Data Privacy Act of 2013. Ethical clearance was given by the University of the East – Ramon Magsaysay Memorial Medical Center Inc. Research Institute for Health Science Ethics Review Committee.

Eligible subjects were asked to sign an informed consent for access to their records. A review of the clinical records was performed for appropriate entry to the case report form (CRF).

The primary outcome of interest was the glycemic control of the subjects based on the ADA general recommendation of HbA1c <7%.

The secondary outcomes were to observe the current trends in the use of glucose-lowering agent (GLA), the prevalence and management of diabetes complications, and the clinico-socio demographic profile of patients with diabetes in the Philippines.

This study included patients with Type 2 diabetes for at least one year, recruited from the clinics of doctors who have taken courses at the Institute for Studies on Diabetes Foundation, Inc. (ISDFI), and who have volunteered to participate in this study. These ISDFI doctors were general practitioners, family physicians, and internal medicine specialists with clinics from all three major islands of the Philippines. Data collection was from January 2020 – June 2020. Eligible patients were anonymized and randomized using simple random sampling.

Inclusion criteria: Adult (18 – 80 years old), diagnosed with Type 2 diabetes for at least one year, under the care of the ISDFI doctors for at least one year

Exclusion criteria: Pregnant subjects, patients with end-stage renal disease and currently on dialysis, patients who have been hospitalized 3 months prior to the study, patients who are currently receiving oral or parenteral corticosteroids, patients with hemoglobinopathies and any condition that will affect red blood cell turn over, terminally ill patients or currently receiving treatment for cancer, patients who refuse to sign informed consent form,

The minimum required sample size was set at 196 subjects based on the results of DiabCare 2008 of 85% of patients who did not achieve glycemic control and a confidence level of 95% using the Epi Info sample size calculator with 5% confidence limits.

The minimum required sample size for complications using the same parameters and results from the DiabCare 2008 results were as follows: for the microvascular complications with a prevalence of 68.1%, the computed sample size was 334; for the macrovascular complications with a prevalence of 14.8%, the computed sample size was 194; and for late complications with a prevalence of 9.4%, the computed sample size was 131.

Data collection. There were no mandatory visits in the context of this cross-sectional study. Patients were interviewed during their scheduled clinic visits. A case report form was used to extract the needed information.

Three sets of HbA1c were recorded to define the status of the subject based on the ADA general recommendation. This consists of the current result and the results approximately 3 and 6 months prior to the present consultation. Laboratory-based and point of care (POC) HbA1c results were accepted provided that all HbA1c reported were from the same laboratory or the same POC system to ensure standard reference for HbA1c results per patient.

Micro-, macrovascular complications and diabetes management were recorded in the CRF. Included were the diagnostics, medications, referrals, and the current status of complications.

Summary statistics for continuous variables included *N*, mean, and standard deviation. Summary statistics for discrete variables were presented in terms of absolute

and relative frequencies. Statistical analysis of all data was performed using IBM SPSS software.

Patient demographic data was described by means of absolute and relative frequencies for categorical variables. Mean and standard deviation were used for continuous variables.

Glycemic control was defined as HbA1c <7% based on the ADA general recommendation and the latest HbA1c was used to determine the proportion of patients who were able to achieve this level. To determine the trend of glycemic control, the latest or current HbA1c was compared to the previous HbA1c levels (approximately 3-6 months retrospectively).

Specific mono-therapeutic agents and combinations were recorded to determine the trend in the use of the different GLAs.

Enumeration of the different micro- and macrovascular complications was carried out, and the prevalence of each complication was presented.

Limitations. Given that this was an observational population-based study, there was no temporality involved, and the results were limited to proportions and prevalence of the variables of concern. Some HbA1c laboratory results may not conform with international standards, but this was based on the local standard of practice and was the basis of the doctors as to his or her own management of the patient in his or her locale. Although random sampling may preclude bias, it does not necessarily exempt the study from selection bias because it was the physician who provided the researchers with the list of subjects who matched the inclusion and exclusion criteria in order not to violate the data privacy law.

Results

Clinico-socio demographic profile. A total of 340 patients were included in the study. Two hundred and fifty-five (75%) were from Luzon, thirty-nine (11.5%) were from Visayas, and forty-six (13.5%) were from Mindanao, representing the three major islands of the Philippines.

Clinico-socio demographic parameters. Patients' age ranged from 27 to 80 years with a mean of 61.61 ± 9.96 years. One hundred and thirteen (33.2%) were male and 227 (66.8%) were female patients. The mean duration of diabetes was 12.63 years. Two hundred and thirty (67.6%) respondents attended tertiary education. One hundred and forty (41.2%) respondents were working. Ninety-one (65%) reported an above minimum income, with respect to the regions where they came from.

The patients' body mass index (BMI) ranged from 17.7 to 39.64 with a mean of 25.86 ± 3.78 kg/m^2. (*Table I*)

Majority (90%) of the patients had comorbidities. Eighty-three (24%) patients had one comorbidity, the most common of which was hypertension (47.9%) followed by dyslipidemia (39.4%). One hundred eighteen (35%) of the three hundred forty patients had two comorbidities. Overall, two hundred twenty-four patients (66%) of the

Table I. Clinico-socio demographic profile

AGE	61.6 ± 9.96 years old
AGE GROUP	No. (%)
Young adult (18–39 years)	9 (2.6)
Middle-aged adult (40–59 years)	104 (30.6)
Old adult (60–80years)	227 (66.8)
GENDER	
Male	113 (33.2)
Female	227 (66.8)
Duration of Diabetes (years)	1-40 (Mean: 12.63 years)
EDUCATIONAL ATTAINMENT	
Primary	23 (6.8)
Secondary	87 (25.6)
Tertiary	230 (67.6)
WORKING STATUS	
Yes	140 (41.2)
No	200 (58.8)
INCOME	No. (%)
Below minimum	3 (2.1)
Minimum	46 (32.9)
Above minimum	91 (65.0)
BMI	25.86 ± 3.78
BMI CLASSIFICATION	No. (%)
Normal (18.5–22.9)	70 (21.6)
Underweight (<18.5)	3 (0.9)
Overweight (23–24.9)	69 (21.3)
Obese (>/= 25)	182 (56.2)

Table II. Frequency of comorbidities

Number of co-morbidities	No. (%) (n=340)
None	33 (10)
1 comorbidity	83 (24)
2 comorbidities	118 (35)
3 comorbidities	86 (25)
>3 comorbidities	20 (6)

Table III. Significant Comorbidities

	No. (%) (n=340)
Hypertension	208 (47.9)
Dyslipidemia	193 (39.4)
Obesity	182 (2.1)

Table IV. Current DM management both oral and injectable GLA

Current DM management	No. (%) (n=340)
Oral GLA	197 (58.0)
Injectable only	12 (3.5)
Combined (oral and injectable)	131 (38.5)

Table V. Oral GLA as current DM management

	No. (%) (n=197)
Monotherapy	25 (12.7)
Dual therapy	81 (41.1)
Triple therapy	67 (34.0)
> 3 Oral GLA	24 (12.2)

three hundred and forty patients had two or more comorbidities (*Tables II and III*).

Diabetes management. Of the 340 patients, 197 (58%) received oral GLA only, 12 (3.5%) received injectables only, and 131 (38.5%) received a combination of oral GLA plus injectables (*Table IV*). For those receiving oral GLA only, 25 (12.7%) were on monotherapy (*Table V*). The most commonly used oral agent was biguanide (72.9%), followed by DPP4 inhibitors (64.3%) (*Table VI*). The most common dual therapy combinations were biguanide plus dipeptidyl peptidase-4 inhibitors (43.2%), biguanide plus sulfonylureas (27.2 %), and biguanide plus sodium-glucose co-transporter-2 inhibitors (11.1%) (*Table VII*). For those receiving injectables only, 4 (33.4%) used basal insulin. Three patients (25%) used both basal and prandial insulin, and another 3 patients (25%) had used premixed insulin**.** *(Table VIII)*.

Diabetes complications. Among the 340 patients, 168 (49.4%) were noted to have complications of diabetes while 172 (50.6%) had none reported. (*Table IXa*)

Diabetes complications were categorized as microvascular alone, macrovascular alone, and both microvascular and macrovascular present at the same time in a patient. Out of 168 patients with complications, there were 82 (49%) patients with microvascular DM complications alone, 33 (20%) patients had macrovascular DM complications alone, and 53 (31%) patients had both. (*Table IXb*)

Within the microvascular complications group, neuropathy was noted at 62% followed by nephropathy at 35% and retinopathy at 11%. In the macrovascular complications group, coronary artery disease was the most common at 82%, followed by peripheral artery disease at 27% and others, such as CVA, heart failure, erectile dysfunction, which was loosely grouped together at 33%. (*Table IXc*)

Overall, the most frequent DM complication identified was neuropathy (30.4%), nephropathy (17.3%) and coronary heart disease (16.1%) *(Table IXd)*

Glycemic control assessment (HbA1c). HbA1c results from three time points (6 and 3 months before and the current consult) were taken for each patient. A standard value < 7% HbA1c was the set acceptable target for glycemic control. All 340 patients had data for all three time points.

HbA1c results for patients 6 months before the current consult showed HbA1c values ranging from 5.20 to 14.80 with a mean of 7.76 (SD ± 1.7). A total of 133 patients (39.1%) had HbA1c < 7% and 207 (60.9%) had values ≥ 7%.

Three months before the current consult, the range of HbA1c of the patients were 4.35–14.30 with a mean of 7.41 ± 1.39. A total of 151 patients (44.4%) had HbA1c < 7% whereas 189 (55.6%) had HbA1c ≥ 7%.

Table VI. Types of Oral GLAs

	No. (%)
Biguanides	239 (72.9)
DPP4 Inhibitors	211 (64.3)
SGLT2 Inhibitors	131 (39.9)
Sulfonylureas	125 (38.1)
Thiazolidinediones	35 (10.7)
Alpha Glucosidase Inhibitor	1 (0.3)
Meglitinide	0 (0.0)

Table VII: Types of Dual Therapy

	No. (%)
Biguanides + DPP-4 inhibitors	35 (43.2)
Biguanides+ Sulfonylureas	22 (27.2)
Biguanide +SGLT2 inhibitors	9 (11.1)
Sulfonylureas + DPP-4 inhibitors	7 (8.6)
DPP4-inh + SGLT2 inhibitors	4 (4.9)
Others	4 (4.9)

Table VIII. Injectables as current DM management

	No. (%)
Basal	4 (33.4)
Basal and prandial	3 (25.0)
Premixed (human/analog)	3 (25.0)
Premixed human (2)	
Premixed analog (1)	
Fixed ratio combination (Lixisenatide + Glargine)	1 (8.3)
Basal and premixed	1 (8.3)

Table IX. DM Complications

IXa. DM complication

Presence of DM complication	No. (%) (n=340)
Yes	168 (49.4)
No	172 (50.6)

IXb. Categories of DM complication

	No. (%) (n=168)
Microvascular alone	82 (49.4)
Macrovascular alone	33 (20)
Micro and macrovascular	53 (31)

IXc. Breakdown of DM Complications

Microvascular	No. (%) (n=82)
Neuropathy	51 (62)
Nephropathy	29 (35)
Retinopathy	9 (11)
Macrovascular	**No. (%) (n=33)**
CAD	27 (82)
PAD & DM FOOT	9 (27)
Others	11 (33)

Xd. Top most common DM complications

Type of complication	No. (%) (n=168)
Neuropathy	51 (30.4)
Nephropathy	29 (17.3)
CAD, IHD	27 (16.1)

Table X. Glycemic control status at three different time points

TIMEPOINTS	HbA1c MEAN ± SD		
		<7% HbA1c	≥7% HbA1c
6 MONTHS BEFORE	7.76 ± 1.70	133 (39.1%)	207 (60.9%)
3 MONTHS BEFORE	7.41 ± 1.39	151 (44.4%)	189 (55.6%)
CURRENT CONSULT	7.23 ± 1.30	161 (47.4%)	178 (52.6%)

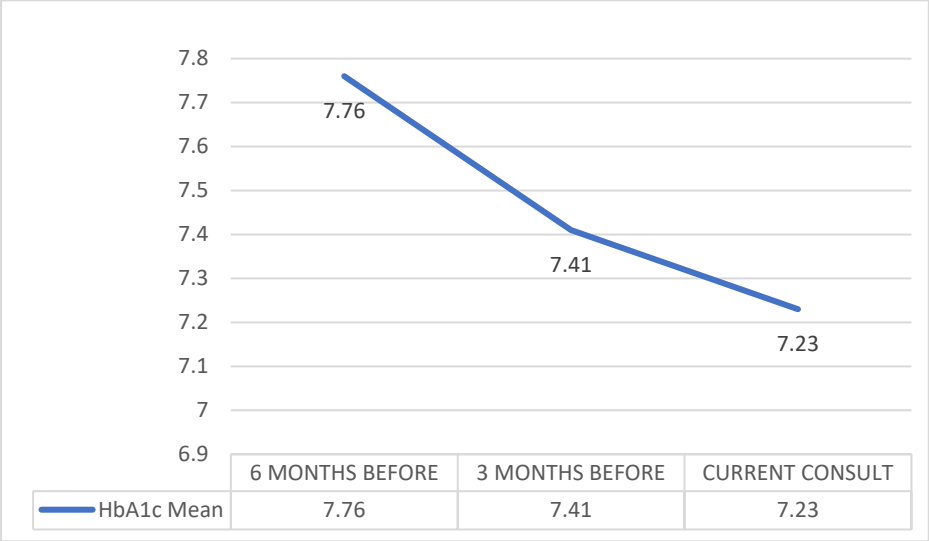

Figure 1. Glycemic control status at three different time points (initial, 3 and 6 months)

At the current consult, the range of HbA1c was 3.81–12.70 with the mean of 7.23 ± 1.30. A total of 161 patients (47.4%) had < 7% HbA1c whereas 179 (52.6%) had ≥ 7% HbA1c (*Table X*)

We note a decreasing trend of mean HbA1c with an increasing percentage of patients achieving HbA1c < 7%. *(Figure 1)*

Discussion

Clinico-socio demographic characteristics. The typical profile of a Filipino patient with diabetes is similar with previous published studies. Our results showed an age range of 27–80 years with a mean age of 61.61 (± 9.96) years. There were more female than male patients. Two hundred twenty-seven (66.8%) were female patients and 113 (33.2%) were male patients. Majority of the patients at 230 (67.6%) had tertiary education, and 200 patients (58.8%) were not working. The participants' BMI was in the range of 17.7–39.64 with a mean of 25.86 ± 3.78 kg/m^2. These results are similar to the 2008 Diabcare study where the mean age was 61.56 (SD 11.3) years, of which 67.4 % were women, and the mean BMI was 25.72 kg/m^2.[5]

When compared with other Asian countries, it is similar to Indonesia with a mean age of 58.4 ± 9.5 years, a female preponderance of 58.6%, and a BMI of 25.2 ± 4.2 kg/m^2.[6] It also concurs with the Centers for Disease Prevention and Control report that showed the incidence rates of diagnosed diabetes were higher among adults aged 45–64 years and those aged 65 and older.[7] In a Chinese study, the mean age was 56.8 ± 13.5 years with a mean BMI of 25.1 ± 4.0 kg/m^2.[8] Vietnam had a mean age of 62.7 years and 58.9% were women.[9]

Majority 307 (90%) of the persons with diabetes had comorbidities with 224 (65.9%) having two or more comorbidities. The most common comorbidity seen was hypertension (47.9%).

Glycemic control. The 2020 data showed better glycemic control with 47.4% having an HbA1c < 7% when compared with the 2008 DiabCare study where only 15% was able to achieve this HbA1c level. In comparison with other countries and regions, the proportion of patients who achieved Hba1c of <7% after 12 months were 32.7% for Europe, 20.4% for India, 43% for the Middle East, 42% for Latin America, and 19.0% for East Asia.[10] Data from neighboring countries showed that the proportion of patients who achieved an HbA1c < 7% after 12 months

were 36.1% Vietnam (2019), 23.4% India (2019), 30.2% Thailand (2006), 33.0% Singapore (1998), 39.7% Hongkong (2008), and 43.5% South Korea (2009). [9,11-15] Considering the time that the studies were performed and select population differences, better glycemic control was seen in this particular populace in the Philippines.

Diabetes complications. For complications of diabetes, 49.4% of the participants had complications. Among these complications, 49% of patients had microvascular complications alone, 20% patients had macrovascular complications alone, and 31% of participants had both. The most common microvascular complications were neuropathy (30.4%), nephropathy (17.3%), and retinopathy (5.4%). The most common macrovascular complications included coronary artery disease (16%), peripheral artery disease and DM foot (5.4%), with others (such as stroke, ED, CHF) at 6.5%. Since patients with end stage renal disease and those on dialysis were excluded, the prevalence of the nephropathy may have been underreported.

In the 2008 DiabCare study, the prevalence of microvascular and macrovascular complications were 68.1% and 14.8%, respectively.[5] Complications were higher in the 2008 study with symptoms of neuropathy found in 45.2%, retinopathy in 30.2%, and microalbuminuria in 15.2% of the patients. As for cardiovascular complications, 10.5% (76/724) had history of angina pectoris, 2.76% (20/724) had myocardial infarction, 1% (7/724) reported CABG/angioplasty, and 4.7% (34/724) reported stroke, 22.1% (160/724) received antiplatelet treatment.

The current results are similar to the 2012 Indonesia Diabcare study that showed the peripheral neuropathy (59.1%) tops the list of complications followed by erectile dysfunction (32.4%), eye complications (29.1%), and cardiovascular complications (22.8%).[6] In a 2009 Philippine study conducted among newly diagnosed patients with T2DM, 20% already had peripheral neuropathy, 42% had proteinuria, and 2% had diabetic retinopathy all upon initial consultation.[16,17]

The Vietnam Diabcare study showed that apart from dyslipidemia (81.2%) and hypertension (78.4%), the most common diabetes-related complications were peripheral neuropathy (37.9%) and eye complications (39.5%).[9]

The China Diabcare 2006 showed that the most common complication was cataract (32.4%) followed by neuropathy (29.27), proteinuria (16.49%), and retinopathy (16.20%).[18]

Trend in management. The current study showed that for monotherapy, the most commonly used drug was biguanide (72.9%), followed by DPP-4 inhibitors (64.3%). For dual therapy, the most common combination was biguanide with a DPP-4 inhibitor (43%), followed by biguanide with sulfonylurea (27.4%), and biguanide with an SGLT-2 inhibitor (11.1%).

For the type of insulin used in combination with oral medications, basal insulin was the one most commonly used. For those who used injectables alone, the most common injectable used was basal insulin (33.4%), followed by basal combined with prandial insulin and premixed insulin use, both similar at 25%.

When compared with the 2008 DiabCare study, we can see an increase in the use of DPP-4 inhibitors and a decline or absence in the use of thiazolidinediones, alpha glucosidase inhibitors, and meglitinides.[5]

For insulin use, we can also see an increase in the use of basal insulin as compared with the premixed insulin. In the 2008 study, premixed insulin was the most commonly used type of insulin.

This present study was conducted in 2020 when the diabetes guidelines worldwide have evolved with newer drugs being recommended. Perhaps because of the changes in recommendations, especially with regard to safety issues and the cardiovascular and renal protection with the use of some newer agents, this may be the reason for the increase in the usage of DPP-4 inhibitors and SGLT-2 inhibitors in this study.

As for metformin, which is the most commonly used monotherapy agent in this study, the recent guideline for metformin has not changed and it continues to be the first agent of choice for therapy because of its well-established safety and efficacy, besides it being affordable and widely available.

The increase in the use of basal insulin, compared with the 2008 DiabCare study, where premixed insulin was most commonly used, can be attributed to the guideline recommendations to initiate insulin therapy using the basal insulins and perhaps was reinforced by massive education campaigns by the insulin companies on insulin initiation using basal insulins.[5]

In this study, use of basal plus prandial insulin and premixed insulin were equal as the second most common injectable therapy. This is most likely due to the recommendations for intensification of insulin regimens that states that one may intensify with addition of a prandial insulin or shift to premixed insulin.

Conclusion

There was marked improvement in the diabetes care situation in the Philippines from the 2008 study to the 2020 study. Glycemic control defined as HbA1c < 7.0% increased from 15% to 47.4%. The most common DM complication was neuropathy at 30.4% followed by nephropathy at 17.3% and coronary heart disease at 16.1%. For the trend in glucose management, when compared with the 2008 study, there was a shift to the use of DPP-4 inhibitors and a decline in the use of thiazolidinediones, alpha glucosidase, and meglitinides. For insulin use, there was a shift from the use of premixed insulin to more basal insulin usage.

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