



A STUDY TO ASSESS GLYCEMIC CONTROL, BLOOD PRESSURE & LIPID PROFILE GOAL IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL OF WEST BENGAL, INDIA

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DOI: <https://doi.org/10.59551/IJHMP/25832069/2026.7.1.133>

How to cite this article: Ghose M, Alam SKA, Mahapatra U. A Study to Assess Glycemic Control, Blood Pressure & Lipid Profile Goal in Patients with Type 2 Diabetes Mellitus in a Tertiary Care Hospital of West Bengal, India. *Indian J. Health Care, Med. Pharm. Pract.* 2026;7(1):271-276.

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Received: 2 May, 2026, Decision for Acceptance: 8 June, 2026

ABSTRACT

Aim: The aim of the study was to evaluate the differences in BP, glycemic & lipid profile goal attainment rates of Diabetes patients between various parameters like age, sex, BMI, complications, medications & compliance.

Methods: 200 Patients were randomly selected from hospital OPD. Their blood glucose, HbA1c, lipid profile, blood pressure & anthropometric measurements were done & statistically analysed.

Results: Among 200 patients, 65 which is 32.5% of total patients were able to achieve the goal. 85 patients had FBS of 70-130 mg/dl among whom 64.7% achieved the goal & 105 had PBS of <180 mg/dl among whom 57.1% achieved the goal. 90 patients had HbA1c <7 among whom 72% achieved the goal. 175 had Triglyceride of <150 mg/dl among whom 37.1% achieved the goal. 95 had LDL-c <100 mg/dl among whom 65.4% achieved the goal. 110 had BP of <140/90 among whom 59.1% achieved the goal. Among the males, 20% achieved the goal & among the females 53.3% achieved the goal. The mean age of the patients who achieved the goal was 41.00 ± 11.39 yrs & who didn't achieve the goal was 58.74 ± 14.91 yrs. The BMI of them who achieved the goal 30.8% were in normal range, 22.2% were overweight, 33.3% were obese I and 33.3% were obese II.

Conclusion: From this study we can conclude that age, sex, literacy, socioeconomic status, BMI & obesity are having statistically significant role in achieving the desired goal for Glycemic control, BP & Lipid profile. There is significant role of life style & personal habits, patient's awareness, more conservative attitude of treating physician towards diabetes mellitus in achieving the desired goal.

KEYWORDS: Glycemic Control, Blood Pressure, Lipid Profile, Type 2 Diabetes Mellitus.

Introduction

Diabetes mellitus (DM) is a global pandemic. It is the most common group of metabolic disorder characterized by chronic hyperglycemia associated with secondary damage in

multiple organ systems especially kidneys, eyes, peripheral nerves and blood vessels[1].

Across the world, Diabetes Mellitus (DM) prevalence has risen dramatically from 30 million cases to 285 million

cases, over the past two decades. The International Diabetes Federation, on analyzing the recent trends, predicts that the diabetes prevalence will peak to 438 million cases by 2030. In DM, occurrence of both Type 1 and type 2 is increasing throughout the world. Yet, due to raised obesity incidence and physical inactivity which is a result of countries becoming more industrialized, the type 2 DM prevalence has been rising more rapidly[2,3]. These high prevalence trends of DM are mostly seen in Asian countries with India being one among them. Based on multiple epidemiological studies, compared to the non-diabetics of same sex and age, risk of developing cardiovascular disease is doubled in diabetics. The mortality due to cardiovascular diseases in type 2 DM is also increased. The doubled cardiovascular risk among diabetics remains even if the conventional risk factors for cardiovascular disease like hypertension, dyslipidemia, smoking, lack of physical activity are within normal limits[4]. This suggests the presence of multiple other mechanism for the raised risk. Diabetes is a highly disabling disease, which can cause major complications in our body like loss of sight in the form of retinopathy, amputations of the fingers, renal disease, anemia, cardiovascular and brain complications, among others, impairing the functional capacity and autonomy and day to day activities. Short term variability refers to within days or between days variability measured by continuous glucose monitoring, and long term variability refers to the variability over months and years measured by visit to visit fluctuations of glycated hemoglobin (HbA1C).

Several previous studies showed that long-term glycemic variability may predict microvascular complications, diabetic kidney disease, cardiovascular, autonomic neuropathy, macrovascular complications and all-cause mortality in diabetic patients. In recent years, studies have found that HbA1C variability (expressed as intrapersonal SD or coefficient of variance) is an independent risk factor for diabetic complications in type 2 patients and might even be a more reliable measure of glycemic control than the mean HbA1C in type 2 DM[6].

The comprehensive management of diabetes includes achieving an optimum control of 3 parameters- i. HbA1C(<7%), ii. BP(130/80mm of Hg) and iii. LDL-c(<100 mg/dl)[5]. These goals are collectively and popularly known as the HbA1c, BP,Cholesterol (ABC) goals of Diabetes. The awareness about the ABC goals is lacking among the treating doctors and this could be the main reason for poor diabetic control in our country. Comprehensive management of Diabetes includes lifestyle measures, use of oral antidiabetic drugs (OAD) and insulin, optimum control of BP and lipid parameters. However despite the presence of multiple drugs and improved monitoring facilities, the care of diabetes patients remain suboptimal[6].

The present study has been conducted to assess glycemic control, blood pressure and lipid profile goal in patients

with type 2 diabetes mellitus in a tertiary care hospital of West Bengal.

Objectives

1. To evaluate the adequacy of BP, glycemic and lipid profile goals of diabetic patient.
2. To evaluate the differences in goal attainment rates between various parameters like age, sex, BMI, complications, medications & compliance.

Materials & Method

The study has been done in the department of General Medicine Midnapore Medical College and Hospital. Hospital based Cross-sectional observational study was done. Study population included all patients attended hospital OPD with a diagnosis of T2DM for at least 6 months duration, aged between 18 years to 75 years, received a prescription for OAD or insulin. The study duration was 18 months (from 1 st March 2021 to 31 st august 2022). Estimated sample size was 200 patients.

Parameters were studied for base level characteristics are Age, Sex, Height, Weight, Marital status, BP, Waist circumferences, BMI, Smoking history, Alcohol history, Tobacco history. And for laboratory investigation parameters were blood for FBS, PPBS, HbA1c, TG, LDL-c, HDL-c, Creatinine.

Exclusion criterias were age below 18 years, Type-1 DM, Acute coronary syndrome, Stroke, Pregnant / lactating/ planned to be pregnant within 1 year, Patients who were not willing to or not able to return to the same hospital every 3 months for the follow up visits after enrollment, Patients without clear information regarding the medication used, seriously ill patients, those who don't want to be part of the study. We used American Diabetic Association recommendation (2020) while using the ABC (HbA1c, BP, LDL-c) goals. HbA1c- <7%, BP- <140/90 mmHg for most patients, <130/80mmHg for those with higher cardiovascular risk. LDL-c- <100 mg/dl, FBS- 70-130 mg/dl, PPBS-<180mg/dl, TG-<150 mg/dl, HDL-c- 40 mg/dl in males, 50 mg/dl in females, BMI- (according to WHO modification for Asian Indian), <18.5 kg/m² – Under Weight, 18.5 – 22.9 kg/m² – Normal Range, 23 - 24.9 kg/m²-Over Weight, >25 kg/m² - Obesity.

Patients were explained about the study procedure in simple terms in a language that they could understand and only those who agreed to participate voluntarily in this study were included after taking their informed consent. The study subjects were undergo a brief clinical examination that included measurement of the followings-

Weight- recorded in a digital weighing scale. Measured in subjects in light cloths. Height- by using stadiometer. Measured in subjects without shoes. Waist circumferences- at the level of umbilicus using a measuring tape. Blood Pressure- was checked by using an OMRON electronic

instrument over right arm in the sitting position after 30 minutes of rest. 3 readings were taken at 5 minutes intervals. The average (mean) of the 3 readings were taken for study purpose. BMI- body weight in kg/ (height in meter)².

Results

The present study was conducted in 200 patients. Among them 65 which is 32.5% of total patients were able to achieve the goal and 67.5% failed to achieve the goal. The mean age of the patients who achieved the goal was 41.00±11.39 years and the mean age of the patients who did not achieved the goal was 58.74±14.91 years. The association between age and achieving the goal was statistically significant. There were 125 males and 75 females in the study. Among the males, 20% achieved the goal and among the females, 53.3% achieved the goal. The association between sex and achieving the goal was statistically significant (Figure 1).

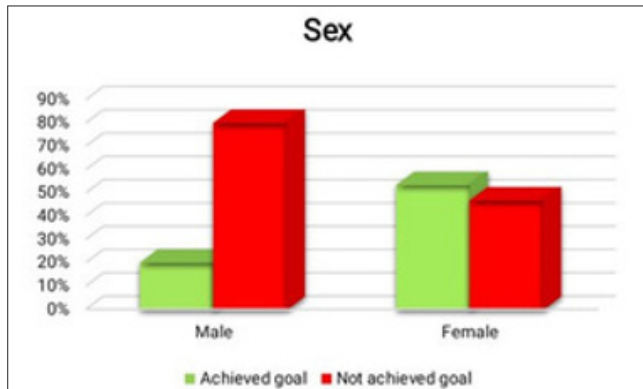


Figure 1. Distribution of the sex of the patients according to goal achievement

There were 150 literates and 50 illiterates in the study. Among the literates, 43.3% achieved the goal and among the illiterates, none achieved the goal. The association between education and achieving the goal was statistically significant (Figure 2).

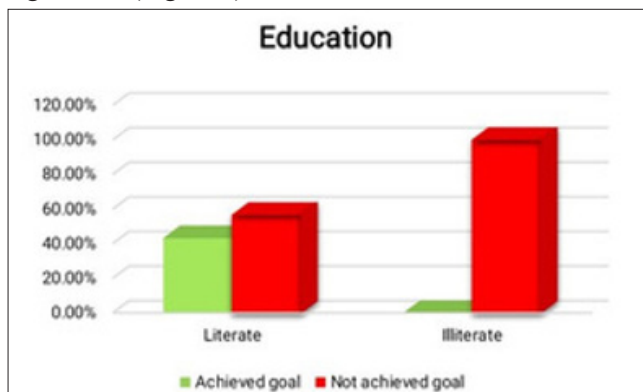


Figure 2. Distribution of the education of the patients according to goal achievement

There were 145 patients from above poverty level and 55 patients from below poverty level in the study. Among the patients from above poverty level, 37.9% achieved the goal and among the patients from below poverty level, 18.2%

achieved the goal. The association between socioeconomic status and achieving the goal was statistically significant.

The mean HbA1c was lower among those who achieved the goal than those who did not achieved the goal and the association between mean HbA1c with achieving the goal was statistically significant (Table 1).

Table 1: Distribution of the mean values of various parameters of the patients according to goal achievement

Parameters	Goal	Mean	SD	P value
BMI	Achieved	23.60	0.78	<0.001*
	Not Achieved	28.18	3.47	
WC	Achieved	87.52	3.26	<0.001*
	Not Achieved	91.63	5.99	
SBP	Achieved	123.69	2.83	<0.001*
	Not Achieved	144.11	13.83	
DBP	Achieved	74.62	2.78	<0.001*
	Not Achieved	87.70	9.65	
WAIST:HIP	Achieved	0.85	0.03	<0.001*
	Not Achieved	0.88	0.04	
FBS	Achieved	124.08	8.95	<0.001*
	Not Achieved	153.11	32.24	
PPBS	Achieved	156.46	18.55	<0.001*
	Not Achieved	224.81	73.74	
LDL-C	Achieved	83.31	13.01	<0.001*
	Not Achieved	123.22	25.99	
TRI-GLYCERIDE	Achieved	83.77	20.34	<0.001*
	Not Achieved	113.30	34.64	
HbA1c	Achieved	6.52	0.21	<0.001*
	Not Achieved	7.84	0.78	

Among the 200 patients, 7.5% had MI, 17.5% had SA (Stable Angina) , 10% had CKD, 12.5% had PAD(Peripheral Artery Disease),5% had HF, 45% had obesity, 40% had smoking habit, 17.5% had tobacco habit, and 20% had alcoholism. But those who achieved the goal did not have the risk factors like MI, SA, CKD, HF and obesity,only 7.7% had PAD, 7.7% had smoking habit, 15.4% had tobacco habit and 30.8% had alcoholism. Among the 200 patients, 85 had FBS of 70-130 mg/dl among whom 64.7% achieved the goal (Figure 3).

Among the 200 patients, 65 were able to achieve the goal. The BMI of them were 30.8% in normal range and 69.2% overweight. And among the 135 patients who did not achieve the goal, 11.1% were in normal range, 22.2% were overweight, 33.3% were obese I and 33.3% were obese II (Figure 4).

Among the 200 patients, 85 had FBS of 70-130 mg/dl among whom 64.7% achieved the goal. Among the 200

patients, 105 had PPBS of <180 mg/dl among whom 57.1% achieved the goal. Among the patients, 175 had Triglyceride of <150 mg/dl among whom 37.1% achieved the goal. Among the patients, 95 had LDL-C of <100 mg/dl among whom 65.4% achieved the goal. Among the patients, 110 had BP of <140/90 mmHg among whom 59.1% achieved the goal. Among the patients, 90 had HbA1C < 7 among whom 72% achieved the goal.

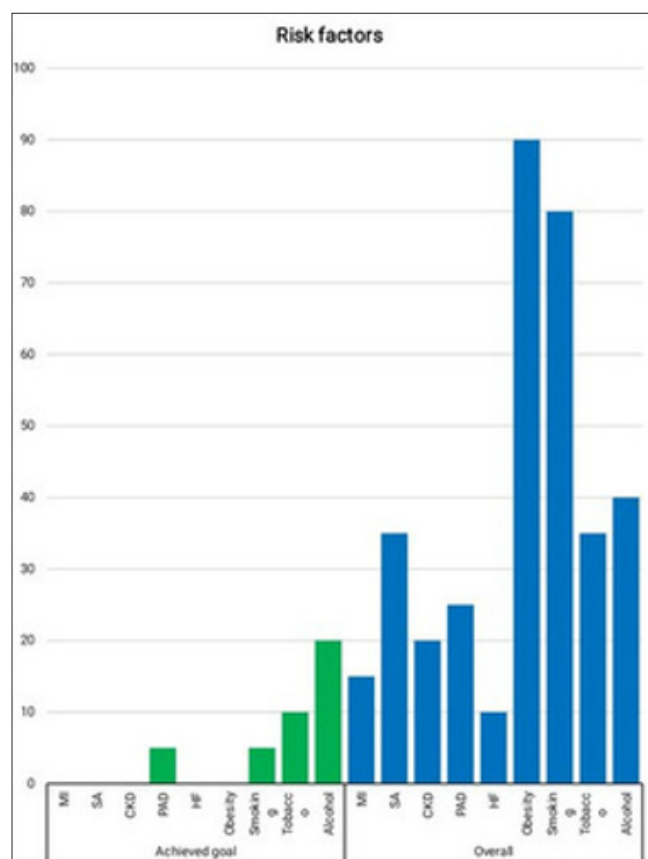


Figure 3. Distribution of the risk factors of the patients according to goal achievement

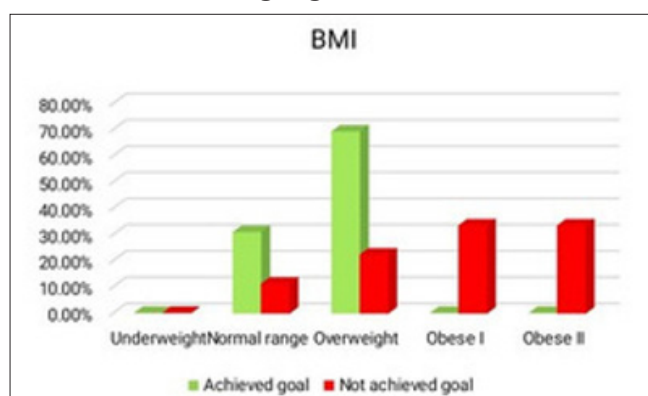


Figure 4. Distribution of the BMI of the patients according to goal achievement

Metformin was the mostly used OAD(100%) among the patients who achieved the goal and DPP4i was the mostly used OAD (100%) among the patients who did not achieve the goal (Table 2).

Table 2: Distribution of various drug use by the patients according to goal achievement

Drugs used	Goal achieved		Goal not achieved	
	N	%	N	%
INSULIN	20	30.77	60	44.44
METFORMIN	65	100.00	95	70.37
DPP4	40	61.54	115	85.19
SGLT2	10	15.38	45	33.33
SULPHONYLUREA	15	23.08	45	33.33
ALPHA GLUCOSIDASE	15	23.08	5	3.70
CCB	40	61.54	105	77.78
ACE/ARB	30	46.15	100	74.07
DIURETICS	0	0.00	40	29.63
BETA BLOCKER	0	0.00	75	55.56
STATINS	50	76.92	135	100.00
FIBRATE	5	7.69	35	25.93
EZETEMIBE	0	0.00	0	0.00

Discussion

India is home to the second largest number of individuals with diabetes in the world, and currently more than 65 million people are estimated to have diabetes in India[7]. If uncontrolled, individuals with diabetes are at risk of developing chronic complications of diabetes such as retinopathy, nephropathy, neuropathy, foot disease, and heart disease, which have the potential to endanger sight, limb, and life. This has profound implications for the public health scenario of the country Good metabolic control, right from the time of diagnosis of diabetes, is key to the prevention of chronic complications. Measurement of glycated hemoglobin (HbA1c) is now universally accepted as the most reliable indicator of long-term glycemic control because it accurately reflects an individual's blood glucose levels over the preceding 2–3 months. Assessment of the level of diabetes control in a population using HbA1c is a good indicator of the quality of diabetes care available to the population[8].

The present study was conducted in 200 patients. Among them 32.5% were able to achieve the goal and 67.5% failed to achieve the goal. The mean age of the patients who achieved the goal was 41.00±11.39 years and the mean age of the patients who did not achieved the goal was 58.74±14.91 years. There were 125 males and 75 females in the study. The association between age and achieving the goal was statistically significant.

Beaton et al conducted a study to evaluate the adequacy of glycemic, lipid, and blood pressure (BP) management for diabetic patients. The mean age of the patients was 61.7 ±13.6. Patients in the diabetic sample were older and more

likely to be male than in the continuously enrolled health plan population[9]. Among the 200 patients, 7.5% had MI, 17.5% had SA, 10% had CKD, 12.5% had PAD, 5% had HF, 45% had obesity, 40% had smoking habit, 17.5% had tobacco habit, and 20% had alcoholism. But those who achieved the goal did not have the risk factors like MI, SA, CKD, HF and obesity; only 7.7% had PAD, 7.7% had smoking habit, 15.4% had tobacco habit and 30.8% had alcoholism. Stratton et al stated that each 1% reduction in updated mean HbA1c was associated with reductions in risk of 21% for any end point related to diabetes (95% confidence interval 17% to 24%, $P < 0.0001$), 21% for deaths related to diabetes (15% to 27%, $P < 0.0001$), 14% for myocardial infarction (8% to 21%, $P < 0.0001$), and 37% for microvascular complications (33% to 41%, $P < 0.0001$). No threshold of risk was observed for any end point. They concluded that, in patients with type 2 diabetes the risk of diabetic complications was strongly associated with previous hyperglycaemia[10]. Among the 200 patients, 85 had FBS of 70-130 mg/dl among whom 64.7% achieved the goal. Among the 200 patients, 105 had PPBS of <180 mg/dl among whom 57.1% achieved the goal. Among the 200 patients, 175 had Triglyceride of <150 mg/dl among whom 37.1% achieved the goal. The U.S. National Health and Nutrition Examination Survey (NHANES) 2007–2010 reported that 52.5% of adults diagnosed with diabetes achieved HbA1c $< 7.0\%$ [11]. In the Korean National Health and Nutrition Examination Survey, 49.1% of adults diagnosed with diabetes had HbA1c $< 7.0\%$ in 2010. A national survey in China showed that 39.7% of patients treated for diabetes had optimal glycemic control in 2010[12]. A joint research among seven Asian countries showed that 32.3% of patients with diabetes enrolled through physicians met target for BP $< 130/80$ mmHg in 2007–2009[13]. The Japanese Society of Hypertension emphasizes that the target BP level for patients with hypertension and diabetes should be less than 130/80 mmHg because strict BP control is necessary in patients with hypertension and diabetes for preventing cardiovascular disease, especially stroke[14]. This indicates that a large proportion of participants with hypertension and diabetes are at high risk of developing cardiovascular disease, including stroke. For LDL-C, approximately one-quarter of participants achieved the ADA LDL-C (< 100 mg/dL) goal and one-half achieved the JDS goal of LDL-C (< 120 mg/dL). The U.S. NHANES 2007–2010 survey showed that more than half of the patients with diabetes achieved the ADA LDL-C goal[11]. In Korea, nearly half of the patients with diabetes reached the ADA LDL-C goal. The relatively low achievement rates for LDL-C goal (< 100 mg/dL) in Japanese patients may be due to the less stringent JDS LDL-C goal (< 120 mg/dL) and/or suboptimal management of dyslipidemia in patients with diabetes. Metformin was the mostly used drug (100%) among the patients who achieved the goal and Statins was the mostly used drug (100%) among the patients who did not achieve the goal. Younger participants were less likely to meet risk

factor goals and had a poorer glycemic control, as reported in previous studies[15].

Conclusion

From the above study we can conclude that- Age, sex, literacy, socioeconomic status, BMI and obesity are having statistically significant role in achieving the desired goal for Glycemic control, Blood pressure and Lipid profile.

At this point it was also observed that the patients who have achieved the desired goal are having very less association with cardiovascular risk factors.

There is significant role of life style and personal habits in achieving the desired goal.

It is found that the majority of the study patients have poor glycemic control.

We can confidently conclude that poor glycemic control indicates the increased chance of developing macrovascular complications as well as microvascular disease in the near future, which will not only affect the productivity and the quality of life of the individuals but also thrust a significant financial burden on their family and the government.

Lack of patient awareness and more conservative attitude of treating physicians towards diabetes management may be the reasons for poor control of diabetes among the patients.

There is a need to increase awareness among patients and healthcare providers regarding the importance of good glycemic control, so that decisions on treatment escalation can be taken and implemented at the appropriate time and patients can be protected from the ill effects of the accumulated and potentially avoidable glycemic burden.

Overall diabetes mellitus is closely associated with dyslipidemia. It is mandatory to treat this dyslipidemia to prevent adverse lipemic status and long term complications to ensure a healthy and happy life in spite of diabetic dyslipidemia.

Conflict of Interest

None

References

1. Kasper, Dennis L. Harrison's manual of medicine. New York, NY, USA: McGraw-Hill, 2005. Platelet indices in diabetes mellitus: indicators of diabetic microvascular complications.
2. Pittas AG. Diabetes Mellitus, Diagnosis and Pathophysiology. Tufts University; 2005-2009.
3. Ramachandran A, Snehalatha C. Current scenario of diabetes in India. J Diabetes. 2009 Mar;1(1): 18-28. doi:0.1111 / j. 1753-0407. 2008. 00004. x. Epub 2008 Dec.
4. Ramachandran A, Das AK, Josh SR, Yajnik CS, Shah S, Prasanna Kumar KM. Current status of diabetes in India and need for novel therapeutic agents. JAPI. 2010

- June; 58(sup 3):7-9.
5. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, Rao PV, Yajnik CS, Prasanna Kumar KM, Nair JD; Diabetes Epidemiology Study Group in India (DESI). High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. *Diabetologia*. 2001 Sep;44(9):1094-101.
 6. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. *Indian J Med Res*. 2007 Mar;125(3):217-30.
 7. International Diabetes Federation: IDF Diabetes Atlas, 6th ed. Brussels: International Diabetes Federation, 2013.
 8. Unnikrishnan R, Anjana RM, Deepa M, et al. Glycemic control among individuals with self reported diabetes in India-The ICMR-INDIAB Study. *Diabetes Technol Ther*. 2014;16(September(a)):596–603.
 9. Beaton SJ, Nag SS, Gunter MJ, Gleeson JM, Sajjan SS, Alexander CM. Adequacy of glycemic, lipid, and blood pressure management for patients with diabetes in a managed care setting. *Diabetes Care* 2004; 27: 694–698
 10. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, Hadden D, Turner RC, Holman RR. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ*. 2000;321(7258):405-12.
 11. Yokoyama H, Oishi M, Takamura H, et al. Large-scale survey of rates of achieving targets for blood glucose, blood pressure, and lipids and prevalence of complications in type 2 diabetes (JDDM 40). *BMJ Open Diabetes Research and Care* 2016;4:e000294
 12. Choi JA, Ko SH, Park YR, et al. Retinal nerve fiber layer loss is associated with urinary albumin excretion in patients with type 2 diabetes. *Ophthalmology* 2015;122:976–81.
 13. Thomas RL, Dunstan FD, Luzio SD, et al. Prevalence of diabetic retinopathy within a national diabetic retinopathy screening service. *Br J Ophthalmol* 2015;99:64
 14. Haslam DW, James WP. Obesity. *Lancet* 2005;366:1197–209.
 15. Bansal D, Gudala K, Muthyala H, et al. Prevalence and risk factors of development of peripheral diabetic neuropathy in type 2 diabetes mellitus in a tertiary care setting. *J Diabetes Invest* 2014;6:714–21.