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Need to improve awareness and treatment compliance in high-risk patients for diabetic complications in Nepal

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ABSTRACT

Objective/introduction It is known that knowledge, awareness, and practice influence diabetic control. We compared factors pertaining to healthy lifestyle (exercising, avoiding smoking), self-help (attending appointments, following treatment regimens), and diabetic awareness in high-risk patients for diabetic complications, specifically, those on insulin versus non-insulin treatment, and also those with a longer diabetic duration (≥5 years) versus a shorter duration.

Methods 200 consecutive patients with type 2 diabetes (52.0±11.6 years) attending diabetic clinic at a referral hospital in Nepal were recruited. A structured questionnaire explored non-clinical parameters including age, gender, diabetic duration, awareness about diabetes control, self-help, and lifestyle. Clinical data were also measured: HbA1c, fasting blood sugar (FBS), blood pressure, and treatment type (insulin, diet/tablet).

Results A significantly higher proportion of patients on insulin (vs non-insulin) or with diabetic duration ≥5 years (vs <5 years) self-reported not doing regular exercise, forgetting to take medicine, and not knowing whether their diabetes was controlled (p≤0.005). HbA1c/FBS levels were significantly higher for patients on insulin or with a longer diabetic duration (p≤0.001). 92% of those on insulin (vs 31% on non-insulin) and 91% with diabetic duration ≥5 years (vs 28% of <5 years) self-reported to seeking medical help due to episodes of uncontrolled blood sugar in the last year (p<0.001).

Conclusion Poor self-help/lifestyle and reduced knowledge/awareness about diabetic control was found in patients on insulin or with longer diabetic duration. This is a worrying finding as these patients are already at high risk for developing diabetic complications. The findings highlight need for targeting this more vulnerable group and provide more support/diabetic educational tools.

Significance of this study

What is already known about this subject?

- It is known that various parameters such as duration of diabetes and insulin treatment are associated with increased risk of diabetic complications. It is also known that non-clinical parameters such as self-help and awareness are important for good diabetes control. However, what is not known is whether patients who are 'more at risk' (on insulin or have longer duration of diabetes) of diabetic complications exhibit greater diabetic awareness and improved self-help and lifestyles, which we examined in this study.

What are the new findings?

- A significantly higher proportion of patients on insulin or those with longer diabetic duration (≥5 years) self-reported to not carrying out regular exercise, forgetting to take medicine, and needing to go to hospital more frequently for uncontrolled blood sugar, and being unaware of whether their diabetes was controlled.

How might these results change the focus of research or clinical practice?

- This was a worrying finding as the patients who are on insulin and longer duration are already at a higher risk of developing diabetic-related complications, and the lack of self-help/awareness will only compound the issue. The findings highlight the need for targeting this more vulnerable group and to provide more support and educational tools for controlling their diabetes.

INTRODUCTION

A recent report by WHO indicates that the number of adults living with diabetes has increased by nearly fourfold since 1980 reaching the current estimate of >422 million globally.[1] Approximately 80% of these adults live in low-income, middle-income countries, predominantly in South Asia including Nepal.[2–4] South Asians living in developed countries such as the UK and the USA, who have their ancestry in the Indian subcontinent, are also at an increased risk of developing diabetes.[4–11] Factors that explain why South Asians are at increased risk of developing diabetes compared with other ethnic groups such as Caucasians and Hispanics have been reported by several previous studies.[12–20]

In addition to genetic factors, lack of awareness about diabetic control and healthy diet, improper lifestyles (eg, not doing regular physical exercise, smoking), inadequate self-help (missing appointments, not complying with treatment regimen), etc, have been shown to be important non-clinical risk factors for the control of diabetes. A recent Cochrane review on data from 33 randomized clinical trials highlights the fact that while the use of pharmacotherapy is important to control blood sugar, blood pressure (BP), cholesterol, etc, there is a lack of evidence that links the non-clinical parameters (eg, self-help, exercise, improved awareness) to diabetic complications, especially in ethnic minority group.[21]

According to WHO, prevalence of diabetes in Nepal is estimated to rise by more than three times by the year 2030 which is greater than the estimated 2.5 times rise in the prevalence of diabetes in India within the same time frame.[22] A geographical variation also exists, that is, in urban areas the prevalence is estimated to be 4.1%[23] and 12% in the semiurban areas.[24]

Management of diabetes has become a major public health challenge for Nepal. One of the main reasons is that a large proportion of patients have poor awareness about diabetes control.[25–30] A survey conducted among various healthcare professionals including diabetic specialists, ophthalmologists, and nurses showed that 48.6% of these professionals thought that patients with diabetes definitely lacked awareness of diabetes and its complications in the eye in Nepal.[25] Evidence of decreased awareness about diabetes and inadequate self-help have been reported in Nepalese patients with diabetes by a number of hospital and community-based studies.[26–30] However, what has not been examined among Nepalese patients with diabetes is whether these factors pertaining to healthy lifestyles (eg, exercising, avoiding smoking), improved self-help (attending appointments, following treatment regimens) and diabetic awareness differ in patients who are on insulin versus tablets/diet treatment, and in patients with longer diabetic duration versus shorter diabetic duration. In countries where resources are stretched, it is important to identify patients who are at risk of developing complications of diabetes and distribute resources appropriately. Patients on insulin or with a longer diabetic duration are at high risk for developing complications if their diabetes becomes uncontrolled.[31] This is especially important in countries like Nepal where patients often do not have immediate access to the doctors/hospitals due to deprived economy, difficult geography, or a lack of reliable transport facilities.

In this study, we investigated diabetic awareness, self-help (attending appointments, taking medicine), and lifestyle regimens (exercising, avoiding smoking) in patients on insulin compared with those who were not on insulin, and also in patients with longer duration of diabetes (≥5 years) compared with those with shorter diabetic duration. We examined whether known variables (increased

Table 1 Summary of the non-clinical variables by self-reported type of treatment used (Insulin vs tablet/diet control)

			Treatment type		P values
Variable	Category	Patients (N)	Insulin (n=37)	Tablet/diet control (n=163)	(Fisher's Test)
Gender	Male	116	21 (56.8%)	95 (58.3%)	0.87
	Female	84	16 (43.2%)	68 (41.7%)	
Is your diabetes controlled?	Yes/maybe	128	11 (29.7%)	117 (71.8%)	<0.001*
	No	72	26 (70.3%)	46 (28.2%)	
Do you exercise regularly?	Yes	54	1 (2.7%)	53 (32.5%)	<0.001*
	No	146	36 (96.3%)	110 (67.5%)	
How often in the last year did you have to go to the hospital as your blood sugar was not controlled?	0 times	115	3 (8.1%)	112 (68.7%)	<0.001*
	1 to ≥10 times	85	34 (91.9%)	51 (31.3%)	
Do you take alcohol?	No	143	31 (83.8%)	112 (68.7%)	0.07
	Yes	57	6 (16.2%)	51 (31.3%)	
Do you smoke?	No	158	33 (89.2%)	125 (76.7%)	0.12
	Yes	42	4 (10.8%)	38 (23.3%)	
How often do you check your blood sugar?	Once within a day to 1 month	38	4 (10.8%)	34 (20.9%)	0.24
	Once within a month to 1 year	162	33 (89.2%)	129 (79.1%)	
How often in the last year you forgot to take your tablet/insulin?	<5 times	152	11 (29.7%)	141 (86.5%)	<0.001*
	≥5 times	48	26 (70.3%)	22 (13.5%)	

*P values significant at <0.05.

duration of diabetes and use of insulin) that are related to higher risk of diabetic complications[32] show differences in parameters such as needing more visits to the hospital for uncontrolled diabetes, compliance with the treatment regimen, and knowledge/awareness profiles so that these specific groups can be targeted for support. We could have defined the high-risk group by HbA1c. However, parameters of knowledge, awareness, and practice in association with HbA1c levels have already been examined in the literature. In addition, not all rural clinics have facilities to carry out HbA1c measures. The study was carried out in Pokhara in the western region of Nepal unlike most of the studies reported above, which were conducted in the capital city, Kathmandu, or its suburbs.

MATERIALS AND METHODS

Participants

Two hundred consecutive patients (mean age=51.97 years, SD=11.57) with type 2 diabetes attending the diabetic clinic at Gandaki Medical College, Teaching Hospital, Pokhara, Nepal, were recruited. Data were collected in between February and July 2015. All patients provided informed consent for taking part in the study. Participants were treated in accordance with applicable ethical guidelines that followed tenets of Helsinki Declaration.

Procedures

A questionnaire (table 1) in Nepalese was administered to each patient. The questionnaire was similar to the one used in our previous study.[33] It was validated by translating it to a local language and then independently translating back to English. All patients were able to respond to all the questions without any help. Clinical parameters such as fasting blood sugar (FBS), HbA1c, and BP were also measured (table 3).

The relationships of parameters of awareness of diabetic control, self-help, and lifestyle to the type of treatment (insulin vs tablet/diet control) or the duration of diabetes (≥5 years vs <5 years) were examined using χ^2 (Fisher's exact test). Independent-samples t-tests were used to identify differences in HbA1c, FBS, BP, and age between different groups of patients (table 3).

RESULTS

There were 116 male patients with diabetes (mean age=50.66 years, SD=11.54) and 84 female patients with diabetes (mean age=53.68 years, SD=11.38). Overall, 52% of all patients self-reported of not knowing whether their diabetes was well-controlled. Out of 200 patients, 42% had to seek help at least once within the last year because their blood sugar was not controlled (ie, owing to incidences of hypoglycemia or hyperglycemia). Although all 200 patients reported of being aware that regular physical exercise was important for diabetes control, only 27% of them confirmed that they carried out some form of physical exercise regularly to control their diabetes. Only 10.8% of those who were on insulin reported checking blood sugar at least once a month compared with the 20.9% who were on tablets/diet control. Although the difference was not significant, it is evident that a large proportion of patients in both groups reported not checking blood sugar at least once within a month. It is interesting that of all patients on insulin only about 11% (4 out of 37) reported that they checked their blood sugar at least once a month. This may be due to a number of factors such as difficulty accessing healthcare providers (eg, doctors, nurses) to get their blood sugar checked, the costs associated with travel and hospital/doctor appointments as well as being unaware of the importance of regular blood sugar checks. This can be ascertained in a follow-up study.

Insulin vs non-insulin

Out of the total 200 patients, 37 (18.5%) patients were on insulin treatment. Table 1 shows the relationship of various non-clinical parameters of diabetic control with the type of treatment (ie, insulin vs tablet/diet control).

70.3% of those who were on insulin treatment reported forgetting to take their medicine ≥5 times in the last year compared with 13.5% of those who were on tablets or diet control. This percentage difference was statistically significant (p<0.05, table 1). When asked if they had simply forgotten to take their diabetic medicine or if they were not taking it because they thought their diabetic condition had improved, all patients responded simply forgetting to take the medicine.

A significantly higher proportion (91.9%) of those who were on insulin treatment reported to having at least one or more incidences of uncontrolled blood sugar in the last year compared with only 31.3% of those who were on tablets or diet control (p<0.001). This may indeed be a result of the fact that a small proportion of those on insulin treatment (about 11%) checked their blood sugar at least once a month, and also that a significant proportion of those on insulin treatment (about 70%) forgot to take their insulin frequently (ie, ≥5 times) in the last year. In addition, a significantly lower proportion (2.7%) of those on insulin treatment reported carrying out exercises compared with 32.5% of those who were on tablet/diet control (p<0.001). More percentage of those on insulin (70.3%) reported that their diabetes had not been controlled compared with 28.2% of those who were on tablets/diet control (p<0.001).

Duration of diabetes

Out of the total 200 patients, 23.0% reported to having diabetic duration for ≥5 years. Table 2 provides the relationship of various non-clinical factors with the duration of diabetes (ie, ≥5 years vs <5 years).

A significantly higher proportion of patients (60.9%) with longer diabetic duration (≥5 years) reported that their diabetes was not controlled compared with 28.6% with shorter duration (p<0.001). Similarly, a significantly higher proportion (58.7%) of patients with longer duration reported to forgetting to take their medicine at least

Table 2 Summary of non-clinical variables by self-reported duration of diabetes (≥5 years vs <5 years)

Variable	Category	Patients (N)	Duration of diabetes ≥5 years (n=46)	Duration of diabetes <5 years (n=154)	P values (Fisher's exact)
Gender	Male	116	22 (47.8%)	94 (61.0%)	0.13
	Female	84	24 (52.2%)	60 (39.0%)	
Is your diabetes controlled?	Yes/maybe	128	18 (39.1%)	110 (71.4%)	<0.001*
	No	72	28 (60.9%)	44 (28.6%)	
Do you exercise regularly?	Yes	54	2 (3.70%)	52 (33.8%)	0.001*
	No	146	44 (95.7%)	102 (66.2%)	
How often in the last year did you have to go to the hospital as your blood sugar was not controlled?	0 times	115	4 (8.7%)	111 (72.1%)	<0.001*
	1 to ≥10 times	85	42 (91.3%)	43 (27.9%)	
Do you take alcohol?	No	143	42 (91.3%)	101 (65.6%)	<0.001*
	Yes	57	4 (8.7%)	53 (34.4%)	
Do you smoke?	No	158	44 (95.7%)	114 (74.0%)	0.001*
	Yes	42	2 (4.3%)	40 (26.0%)	
How often do you check your blood sugar?	Once within a day to 1 month	38	9 (19.6%)	29 (18.8%)	0.91
	Once within a month to 1 year	162	37 (80.4%)	125 (81.2%)	
How often in the last year you forgot to take your tablet/insulin?	<5 times	152	19 (41.3%)	133 (86.4%)	<0.001*
	≥5 times	48	27 (58.7%)	21 (13.6%)	

*P values significant at <0.05.

five times in the last year compared with 13.6% with shorter duration (p<0.001). Also, a significantly higher proportion (91.3%) of those with longer diabetic duration reported to having at least one or more incidences of uncontrolled blood sugar in the last year compared with 27.9% with shorter duration of diabetes (p<0.001). Only 3.7% of those with longer diabetic duration reported to taking part in physical activities compared with 33.8% in the other group. Although the overall exercise regimen was not so good for both groups, the difference was statistically significant between two groups (p=0.001).

Table 3 shows a summary of clinical measurements by both the type of treatment (insulin vs tablet/diet control) and duration of diabetes (≥5 years vs <5 years). Age, FBS, HbA1c and systolic BP were all found to differ statistically significantly between patients on insulin versus tablets or diet control, and also between patients with diabetic duration of ≥5 versus <5 years. The recommended HbA1c target level of ≤6.5[34] was observed in only 8.1% patients who were on insulin treatment and in 11.7% who were on tablet/diet control. The mean age for those who were on insulin treatment (59.4 years) was found to be significantly greater than those on tablet/diet control (50.2 years). It is likely that some of these patients may have been on tablets/diet control before switching to the insulin treatment owing to a greater cost and difficulty associated with insulin injection.[35]

On responding to the reviewer's comments, we ran further analysis by defining a high-risk group with HbA1c (>6.5% vs ≤6.5%). The parameters that were shown to be significant when the high-risk and low-risk groups were defined by insulin and diabetes duration also emerged as significant (table 4): these include 'Is your diabetes controlled?', 'Do you exercise regularly?'. The parameter 'How often in the last year did you have to go to the hospital as your blood sugar was not controlled? was also shown to be 'near significant' at a p value of 0.07. Additionally the parameter 'How often do you check your blood sugar?' was shown to be significant when the patients were categorized by HbA1c levels, showing that patients who reported to checking their blood sugars more regularly also had better control of their diabetes.

DISCUSSION

It is known that prevalence of diabetes and its complications is significantly higher in people of South Asian origin compared with the Caucasians and Hispanics.[10 21 36] In this study, we examined how parameters of self-help (attending appointments, taking medicine), lifestyle (exercising, smoking), and awareness about diabetic control influenced (i) patients on insulin treatment compared with those on non-insulin treatment and (ii) patients with longer diabetic duration compared with those with shorter diabetic duration. Patients on insulin

Table 3 Summary of clinical measurements by type of treatment used (insulin vs tablet/diet control) and duration of diabetes (≥5 years vs <5 years)

Variable	Therapy				Mean difference (S – N)				Duration				Mean difference (S – N)			
	Insulin		Tablet/diet control			95% confidence limits			≥5 years		< 5 years			95% confidence limits		
	n=37		n=163						n=46		n=154					
	Mean	SD	Mean	SD	Difference	Lower	Upper	P values	Mean	SD	Mean	SD	Difference	Lower	Upper	P values
Age (years)	59.4	11.3	50.2	10.9	9.2	5.3	13.1	<0.001*	61.3	10.5	49.1	10.3	12.2	8.7	15.6	<0.001*
HbA1c	9	1.4	7.6	1.4	1.4	0.9	1.9	<0.001*	9	1.4	7.6	1.4	1.4	0.9	1.9	<0.001*
Fasting blood sugar	170.7	41.7	135.1	33.7	35.6	20.9	50.4	<0.001*	168.7	42.2	133.6	32.5	35.1	21.5	48.5	<0.001*
Systolic blood pressure	133.8	13.2	129	12.3	4.8	0.3	9.3	0.04*	135.7	13.9	128.2	11.7	7.5	3	12	<0.001*
Diastolic blood pressure	85.1	9.6	83.3	8.7	1.8	−1.3	5.1	0.25	85.4	9.8	83.1	8.6	2.3	−5.6	5.3	0.11

Significance of mean differences were obtained using Independent-samples t-tests.
*P values significant at <0.05.

treatment or with longer diabetic duration are often at a higher risk of developing complications if their diabetes becomes uncontrolled.[31]

Interesting and important findings evidenced by our data are that more than half of the total number of all patients examined were not sure whether their diabetes was well-controlled. HbA1c target level of ≤6.5 was found in only 11% of the total patients. Only 27% of the total 200 patients confirmed that they carried out some form of physical exercise regularly to control their diabetes. A substantial proportion of the patients (42%) had to seek help at least once within the last year because their blood sugar was not controlled.

A higher proportion of patients on insulin treatment reported forgetting to take their medicine ≥5 times a year compared with those on tablets or diet control. This suggests a poorer compliance to treatment regimen by patients on insulin. Furthermore, a significantly higher proportion of patients on insulin (91.9%) reported to having at least one or more incidences of uncontrolled blood sugar in the last year compared with 31.3% who were on tablets or diet control. A significantly greater proportion of patients on insulin were found to be less likely to take part in physical exercises, and they also reported that their diabetes was not controlled.

A significantly greater proportion of patients with a longer diabetic duration (≥5 years) were found to have reduced awareness of whether their diabetes was well-controlled, and they also carried less physical exercise, had more number of the incidences of uncontrolled blood sugar, and forgot to take their medicine.

To summarize, overall patients showed lack of knowledge/awareness about diabetes control. Patients on insulin or with longer diabetic duration who are actually at more risk of developing diabetic complications showed poor compliance to treatment regimen, carried out less exercise, and were found to have inadequate self-help. Interventions aimed at increasing awareness about diabetes, frequency of blood sugar checks, reminders for follow-up visits, compliance with the treatment regimens, and exercise may help in proper control of diabetes and its complications. Furthermore, our data suggest that not only thee is a need to receive diabetic education/awareness programs and practice healthy lifestyle and self-help regimens right from the time that patients are diagnosed with diabetes,[24] but there is a need to reconsolidate this in the more risky group which are the insulin dependent and those with longer duration of diabetes. It is hoped that the findings of this study are useful to local policymakers and healthcare planners to develop appropriate educational tools for controlling diabetes. It is important that the diabetes education tool focus on improving self-management and awareness so that patients are more careful to monitor their blood sugar levels closely, are aware of the possible complications of uncontrolled blood sugar, adhere to the treatment regimen, and do regular physical exercise to control diabetes.

The limitations of this study are that the results may not be representative of the general population as data were

Table 4 Summary of non-clinical variables by HbA1c levels (≤6.5% vs >6.5%)

Variable	Category	Patients (N)	HbA1c level		P values
			HbA1c≤6.5% (n=23)	HbA1c>6.5% (n=177)	(Fisher's test)
Gender	Male	116	14 (60.9%)	102 (57.6%)	0.83
	Female	84	9 (39.1%)	75 (42.4%)	
Is your diabetes controlled?	Yes/maybe	128	20 (87.0%)	108 (61.0%)	0.02*
	No	72	3 (13.0%)	69 (39.0%)	
Do you exercise regularly?	Yes	54	15 (65.2%)	39 (22.0%)	<0.001*
	No	146	8 (34.8%)	138 (78.0%)	
How often in the last year did you have to go to the hospital as your blood sugar was not controlled?	0 times	115	6 (26.1%)	98 (55.4%)	0.07
	1 to ≥10 times	85	17 (73.9%)	79 (44.6%)	
Do you take alcohol?	No	143	16 (69.6%)	127 (71.8%)	0.81
	Yes	57	7 (30.4%)	50 (28.2%)	
Do you smoke?	No	158	17 (73.9%)	141 (79.7%)	0.59
	Yes	42	6 (26.1%)	36 (20.3%)	
How often do you check your blood sugar?	Once within a day to 1 month	38	8 (34.8%)	30 (16.9%)	0.05
	Once within a month to 1 year	162	15 (65.2%)	147 (83.1%)	
How often in the last year you forgot to take your tablet/insulin?	<5 times	152	20 (87.0%)	132 (74.6%)	0.30
	≥5 times	48	3 (13.0%)	45 (25.4%)	

*P values significant at <0.05.

collected from clinical population attending a diabetic clinic. Also duration was self-reported (patients did not have documentation of exact duration of diabetes, and it was not possible to retrieve from hospital records).

Contributors SP and RPS conceived and designed the study. GG and TU collected and processed the data. MP, RPS and SP analyzed the data. RPS, SP, RR and MP wrote and revised the paper.

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Competing interests None declared.

Patient consent Not required.

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