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 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.

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.

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. Approximately 80% of these adults live in low-income, middle-income countries, predominantly in South Asia including Nepal. 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. 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.
Clinical Care/Education/Nutrition

In addition to genetic factors, lack of awareness about diabetic control and healthy diet, improper lifestyles (e.g., not doing regular physical exercise, smoking), inadequate self-help (missing appointments, not complying with treatment regimens), 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 (e.g., 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 semirural 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.35 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 (e.g., 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

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### Table 1

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

| Variable | Category | Patients (N) | Treatment type | P values (Fisher’s Test) |
|----------|----------|--------------|----------------|-------------------------|
|          |          |              | Insulin (n=37) | Tablet/diet control (n=163) |
| 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 \(\chi^2\) (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<0.005, 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 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 | P values (Fisher's exact) |
|-----------------------------------|----------------|--------------|----------------------|---------------------------|
|                                   |                |              | ≥5 years (n=46)      | <5 years (n=154)          |
| 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 (3.7%)             | 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% 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) | P values | 95% confidence limits | Therapy          | Mean difference (S – N) | P values | 95% confidence limits |
|---------------------------|------------------|-------------------------|----------|-----------------------|------------------|-------------------------|----------|------------------------|
|                           | Insulin          | Tablet/diet control     |          |                       | ≥5 years         | < 5 years               |          |                        |
|                           | n=37             | n=163                   |          |                       | n=46             | n=154                   |          |                        |
| Age (years)               | 59.4 11.3        | 50.2 10.9               | 9.2      | 5.3 13.1              | 61.3 10.5        | 49.1 10.3               | 12.2     | 8.7 15.6               |
| HbA1c                     | 9 1.4            | 7.6 1.4                 | 1.4      | 0.9 1.9               | 9 1.4            | 7.6 1.4                 | 1.4      | 0.9 1.9                |
| Fasting blood sugar       | 170.7 41.7       | 135.1 33.7              | 35.6     | 20.9 50.4             | 168.7 42.2       | 133.6 32.5              | 35.1     | 21.5 48.5              |
| Systolic blood pressure   | 133.8 13.2       | 129 12.3                | 4.8      | 0.3 9.3               | 135.7 13.9       | 128.2 11.7              | 7.5      | 3 12                   |
| Diastolic blood pressure  | 85.1 9.6         | 83.3 8.7                | 1.8      | −1.3 5.1              | 85.4 9.8         | 83.1 8.6                | 2.3      | −5.6 5.3               |

Significance of mean differences were obtained using Independent-samples t-tests.

*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.

**Ethics approval** Institutional ethics committee, Gandaki Medical College Teaching Hospital, Pokhara, Nepal.

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