INTRODUCTION

The WHO estimated that 80% of diabetes deaths occur in low- and middle-income countries and project that such deaths will double between 2016 and 2030. It has been further estimated that the global burden of type-2 diabetes is expected to increase to 438 million by 2030 from 285 million people (recorded in 2010). Similarly, for India, this increase is estimated to be 58%, from 51 million people in 2010 to 87 million in 2030. However, debates, discussions, and deliberations aside, the fundamental thing is to know what exactly diabetes is [1].

Diabetic peripheral neuropathy is a heterogeneous which frequently leads to foot ulcer. It is recommended to screen all individuals with diabetes at least annually [2]. Of all the complications of diabetes, those that occur in the foot are considered the most preventable. Poor knowledge and attitude toward diabetes and its complications, i.e. foot care and poor foot care practices were identified as important risk factors for foot problems in diabetes [3]. Evidence suggested that consistent patient education with prophylactic foot care for those judged to be at highest risk may reduce foot ulceration and amputations [4]. Changes in blood vessels and nerve often leads to ulceration and subsequent limb amputation. It is one of the most costly complications of diabetes, especially in communities with inadequate footwear. It results from both vascular and neurological disease processes. Regular inspection and good care of the foot can prevent amputations. Comprehensive foot programs can reduce amputation rates by 45–85% [5].

Although there is a large amount of literature on diabetic foot and the importance of foot care, there are limited published data on knowledge, attitude, and practices (KAPs) of foot care among diabetic patients in Uttar Pradesh, India. Thus, this study was conducted to assess the KAPs regarding diabetes and foot care in diabetic and non-diabetic participants as well as to detect the efficiency of nerve heed herbal oil (NHHO) prepared by Diabport Pvt. Ltd. on pain associated with nerves.

METHODS

Diabport Healthcare Pvt. Ltd. (Developed under Kalam Center for Innovation and Incubation of Startups) assessed general awareness about foot care with respect to diabetic foot prevention strategies and will help to improve quality of care for diabetic patients to reduce the burden associated with diabetes foot complications as well as it can aid health-care providers and policymakers to develop targeted self-management education programs for people with diabetes. Educating patients is likely to be effective if we are aware of their current knowledge and practices on foot care.

RESULTS

Kalyanpur, Kanpur, Uttar Pradesh, India) toward diabetes and foot care was performed. Samples of NHHO were suggested to apply on foot. The questionnaire was composed of three parts: knowledge, attitude, and practices (KAPs) of foot care as well as NHHO was suggested to apply on foot. The questionnaire was developed by Diabport Healthcare Pvt. Ltd. on pain associated with nerve. The information obtained will inform the current situation in relation to diabetic foot prevention strategies and will help to improve quality of care for diabetic patients to reduce the burden associated with diabetes foot complications as well as it can aid health-care providers and policymakers to develop targeted self-management education programs for people with diabetes. Educating patients is likely to be effective if we are aware of their current knowledge and practices on foot care.

Conclusion: It can be concluded that there is an urgent need to aware people regarding diabetes and its complications and provide continuous foot care education to patients. In this pilot study, NHHO was found to be effective as well as safe to treat nerve and joint pain.

Keywords: Sociodemographic profile, Knowledge, attitude, practices, Nerve heed herbal oil.
Statistical analysis data were analyzed using the Statistics Package for Social Science (SPSS) version 21 for Windows. All continuous data were expressed in terms of mean (SD), and categorical variables were expressed in form of number and percent. Differences in continuous variables between groups were analyzed using independent t-test. In addition, the comparison between two groups was done by Pearson correlation (Chi-square test) for categorical variables [7]. The effect of age of diabetic and non-diabetic individuals to examine whether there is a difference between means. We analyzed inference of socioeconomic characteristics for gender and education level ($\chi^2 (3) = 4.42, p<0.05$) of participants. When the same test was applied for the inference of smoking on diabetes, results revealed that there is a significant difference ($\chi^2 (2) = 13.18, p<0.05$) between the groups of participants (Table 1). Prepared questionnaire on knowledge of DN was studied among the study population (Table 2).

The total positive score for all knowledge questions was 18%. To test the hypothesis that the knowledge and attitude means were equal, dependent samples t-test was performed. The null hypothesis of an equal correlation between knowledge and attitude was rejected ($t (14) = -7.4, p<0.001$). Since our paired samples, result revealed that the mean number of attitude (M=62) was greater than the mean number of knowledge (M=12). In the same way, dependent samples t-test was conducted to compare knowledge and practice of participants ($t (14) = -2.62, p<0.05$) towards DN. Mean number of practice (M=26) was greater than the mean number of knowledge (M=12). 62.27% of participants showed favorable attitude (passed the study), while 37.73% of participants showed unfavorable attitude toward DN (Table 3). Paired samples t-test was conducted to identify the significant difference between attitude and practice of participants ($t (14) = 3.97, p<0.05$) on DN. Mean number of attitude (M=62) was greater than practice (M=26). Table 4 summarizes foot care practices for the study population. A one-way ANOVA was conducted to evaluate the null hypothesis that there is no difference in KAP toward DN in the study population (N=180). The F test for KAP ($F (2, 34) = 17.80$, which was statistically significant at 5% level ($p<0.001$).

| Characteristics                        | Total population (total=180) | Diabetes present | Diabetes absent | p value |
|----------------------------------------|------------------------------|------------------|----------------|---------|
| Age                                     |                              |                  |                |         |
| <60                                     | 10                            | 05               | 05             | 0.68    |
| >60                                     | 170                           | 96               | 74             |         |
| Gender                                  |                              |                  |                |         |
| Male                                    | 164                           | 93               | 71             | 0.60    |
| Female                                  | 16                            | 08               | 08             |         |
| Educational level                       |                              |                  |                |         |
| No formal education                     | 27                            | 16               | 11             | 0.22    |
| Primary education                       | 49                            | 29               | 20             |         |
| Secondary and vocational                | 52                            | 23               | 29             |         |
| Post-secondary education                | 52                            | 33               | 19             |         |
| Smoking                                 |                              |                  |                |         |
| Currently smoking                       | 30                            | 24               | 06             | 0.001   |
| Past smoker                             | 27                            | 19               | 08             |         |
| Never smoked                            | 123                           | 58               | 65             |         |

**DISCUSSION**

Statistical results revealed that significant difference was found between diabetic and non-diabetic participants with respect to sociodemographic profiles. Null hypothesis rejected and concluded that there is a difference between means. We analyzed inference of age of diabetic and non-diabetic individuals to examine whether diabetes is independent to age or not. Chi-square test suggested that diabetes is independent of age [9]. It was also found that diabetes was independent of gender and education level. When the same test was applied for the inference of smoking on diabetes, results showed a
Table 2: Questionnaire for patient’s knowledge score in percentage

| Knowledge                                                                 | Response (%) |
|---------------------------------------------------------------------------|--------------|
| What is diabetes?                                                         | Positive: 54 | Negative: 46 |
| Do you know what DN is?                                                  | Positive: 15 | Negative: 85 |
| Do you know constantly elevated glucose level can lead to DN?            | Positive: 14 | Negative: 86 |
| Do you know numbness in legs and/or feet may lead to DN?                 | Positive: 13 | Negative: 87 |
| How DN can be prevented?                                                 | Positive: 14 | Negative: 86 |
| Do you know DN is related to nerve damage?                                | Positive: 18 | Negative: 82 |
| Which one is the correct foot cares in a diabetic person?                | Positive: 09 | Negative: 91 |
| Do you know the relation between diabetes and nerve?                     | Positive: 08 | Negative: 92 |
| What treatments are available for DN?                                    | Positive: 20 | Negative: 80 |
| Do you know other complications of diabetes?                             |              |              |
| Total percentage                                                         | Positive: 18.0 (not passed) | Negative: 82.0 |

DN: Diabetic neuropathy

Table 3: Questionnaire for patient’s attitude toward DN in percentage

| Attitude                                                                 | Response (%) |
|--------------------------------------------------------------------------|--------------|
| Do you ever have any burning pain in your legs and/or feet?             | Agree: 57    | Not agree: 43 |
| Do you get muscle cramps in your legs and/or feet?                      | Agree: 42    | Not agree: 58 |
| Have you ever had an open sore on your foot?                            | Agree: 71    | Not agree: 29 |
| Has your doctor ever told you that you have DN?                         | Agree: 91    | Not agree: 09 |
| Do you feel weak all over most of the time?                             | Agree: 40    | Not agree: 60 |
| Are your symptoms worse at night?                                       | Agree: 37    | Not agree: 63 |
| Do your legs hurt when you walk?                                        | Agree: 46    | Not agree: 54 |
| Are you able to sense your feet when you walk?                          | Agree: 41    | Not agree: 59 |
| Is the skin on your feet so dry that it cracks open?                    | Agree: 56    | Not agree: 44 |
| Do you know foot ulcers (open sores) are caused by poor medical care?   | Agree: 71    | Not agree: 29 |
| Do you know dry skin on the feet can cause foot ulcers?                 | Agree: 77    | Not agree: 23 |
| Do you know lost or reduced feeling means poor circulation in my feet?  | Agree: 75    | Not agree: 25 |
| Do you know wearing shoes that fit properly can prevent foot ulcers from occurring? | Agree: 87 | Not agree: 13 |
| Do you know lost or reduced feeling in feet could lead to injuries?     | Agree: 830   | Not agree: 17 |
| Diabetes doctors can prevent foot ulcers (open sores) from occurring     | Agree: 60    | Not agree: 40 |
| Total percentage                                                         | Agree: 62.27 (passed) | Not agree: 37.73 (not passed) |

Table 4: Questionnaire for patient’s foot care practice in percentage

| Practice                                                                 | Response (%) |
|--------------------------------------------------------------------------|--------------|
| Are you performing proper foot care?                                    | Appropriate: 60 | Inappropriate: 40 |
| Inspect footwear before wearing?                                        | Appropriate: 58 | Inappropriate: 42 |
| Walk bare feet in the house often?                                     | Appropriate: 77 | Inappropriate: 23 |
| Walk bare feet outside the house often?                                 | Appropriate: 09 | Inappropriate: 91 |
| Daily washing the feet?                                                 | Appropriate: 38 | Inappropriate: 62 |
| Talcum powder use for keeping the interdigital space dry?               | Appropriate: 26 | Inappropriate: 74 |
| Keep the skin of feet soft to prevent dryness?                          | Appropriate: 06 | Inappropriate: 94 |
| Daily change of socks?                                                  | Appropriate: 11 | Inappropriate: 89 |
| Trim toenails straight with care?                                       | Appropriate: 49 | Inappropriate: 51 |
| Warning signs for which consultation is required?                       | Appropriate: 23 | Inappropriate: 77 |
| Using warm water for washing feet?                                      | Appropriate: 14 | Inappropriate: 86 |
| Drying the feet after washing?                                          | Appropriate: 19 | Inappropriate: 81 |
| Total percentage                                                         | Appropriate: 32.5 (not passed) | Inappropriate: 67.5 (passed) |

Table 5: Comparing KAP scores on DN between patients with and without diabetes

| Response (%) | % Individuals with diabetes (n=101) | % Individuals without diabetes (n=79) | p value |
|--------------|-------------------------------------|--------------------------------------|---------|
| Knowledge    |                                     |                                      |         |
| Yes          | 29                                  | 3                                   | <0.001  |
| No           | 71                                  | 97                                  |         |
| Attitude     |                                     |                                      |         |
| Agree        | 91                                  | 18                                  | <0.001  |
| Not agree    | 09                                  | 82                                  |         |
| Practice     |                                     |                                      |         |
| Appropriate  | 32                                  | 21                                  | >0.05   |
| Inappropriate| 68                                  | 79                                  |         |

KAP: Knowledge, attitude, and practice; DN: Diabetic neuropathy

Table 6: Effect of NHHO on DN symptoms

| Symptoms of DN | Score* | Side effects |
|----------------|--------|--------------|
| Joint pain     | 1      | No reaction  |
| Weakness       | 0      |              |
| Numbness of extremities | 0 |              |
| Loss of sensation in nerves | 0 |              |
| Burning sensation in nerves | 0 |              |

*i=absent, 1=slight, 2=present

participants with attitude toward DN can help prevent neuropathy in individuals significantly more than having knowledge of DN [11]. Statistical results also suggested narrow significant difference between knowledge and practice of participants involved in the study, which proved that knowledge had a direct impact on practice but to a small extent [12]. Thus, it can be concluded that participants with good foot care practice can help to eradicate neuropathy in individuals significantly more than knowledge of DN in individuals. Paired samples t-test between attitude and practice rejected the null hypothesis. Thus, it can be concluded that attitude of participants had a direct impact on practice of DN. Foot self-inspection was done regularly (6–7 days...
Knowledge of foot care is low among patients with diabetes. Their knowledge can be improved by education and proper foot care modeling by health-care providers. It is essential to assess patients’ beliefs and behavior so as to offer education and utilize educational methods that facilitate them to care for their feet efficiently. Knowledge alone, however, does not always lead to change in behavior and practice toward foot care. There is a need for continuous education on foot care to improve patients’ knowledge of risks and foot self-care practices. Furthermore, our results showed that daily application of NHHO prepared by Diaport Healthcare Pvt. Ltd. significantly reduced the amputation of digits and limbs make it a serious issue [17]. Application of herbal oil showed no adverse effects in the present study, which indicated the safety of this formulation. Active ingredients present in this herbal formulation are known to possess anti-inflammatory and analgesic actions, which aid in alleviating the increased inflammation associated with painful DN.

CONCLUSION

Knowledge of foot care is low among patients with diabetes. Their knowledge can be improved by education and proper foot care practices that facilitate them to care for their feet efficiently. Knowledge alone, however, does not always lead to change in behavior and practice toward foot care. There is a need for continuous education on foot care to improve patients’ knowledge of risks and foot self-care practices. Furthermore, our results showed that daily application of NHHO prepared by Diaport Healthcare Pvt. Ltd. significantly reduced the symptoms of painful DN without any adverse side effect. The herbal oil may be effective in treating painful DN along with routine standard care. It must, however, be emphasized that intensive hyperglycemic control also plays an important role in reducing neuropathic pain in patients with diabetes.

CONFLICT OF INTEREST

There is no conflict of interest.

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