

# Effects of a health education programme on risk factors for diabetes mellitus: A case in Zambezi region, Namibia

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**Background.** This article forms part of a study that developed, implemented and evaluated a health education programme in Zambezi region, Namibia. It has been confirmed that educational intervention raises awareness about diabetes in countries such as Cameroon. No formal health education programme on diabetes has been validated in its effectiveness specifically for Zambezi region in terms of improving knowledge in communities to counter the risk of diabetes.

**Objective.** To evaluate the effectiveness of a health education programme in improving knowledge regarding risk factors of diabetes in Zambezi region.

**Methods.** The study had a quasi-experimental non-equivalent design, where pre-test and post-test control groups were used. Two groups, namely the control and the experimental group, were selected using purposive sampling. A paired-samples *t*-test was used to evaluate the differences in the scores by comparing the results within groups pre and post intervention.

**Results.** Each group comprised 22 participants. The control group was selected from Sibbinda, while the experimental group was selected from Katima Urban. The validation of the effectiveness of a health education programme revealed a change in the level of knowledge regarding various aspects of diabetes. There was a significant difference in score pre and post intervention in the experimental group at  $t(21)=4.294, p=0.000$ .

**Conclusion.** This study showed positive effectiveness of a health education programme in improving knowledge regarding risk factors for diabetes in Zambezi region.

*South Afr J Pub Health* 2022;5(2):47-50. <https://doi.org/10.7196/SHS.2022.v5.i2.153>

Diabetes mellitus, long considered a disease of minor significance in world statistics on health, is now taking its place as one of the main threats to human well-being in the 21st century. Noticeably, the prevalence of diabetes reveals a global trend of rapid growth over the past few decades.<sup>[1]</sup> The global prevalence of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% of the adult population. Diabetes caused 1.5 million deaths in 2012, with an additional 2.2 million deaths attributed to higher-than-optimal blood glucose.<sup>[2]</sup> Moreover, global reports on diabetes in 2016 estimated that 422 million adults were living with diabetes in 2014, compared with 108 million in 1980. Statistics reported by the International Diabetes Federation (IDF) provide shocking news that worldwide, two individuals develop diabetes every 10 seconds or die of diabetes-related conditions.<sup>[3]</sup>

Diabetes has become an extremely serious public health problem that places a heavy socioeconomic burden on every country, through direct medical costs as well as absenteeism in

the workplace and consequent loss of wages.<sup>[2]</sup> Studies provide evidence that diabetes affects patients, employers and society at large, not only by creating a loss of employment but also by contributing to health-related work limitations for those who remain employed.<sup>[4]</sup> Looking at the impact of a disease on population, diabetes remains a killer disease that is waging a war against humanity, threatening mankind's survival, growth and development on a global scale.<sup>[5]</sup> In 2012, diabetes claimed the lives of 1.5 million people worldwide. Furthermore, 43% of 3.7 million diabetes-related deaths worldwide occur in individuals <70 years old. The percentage of deaths attributable to high blood glucose or diabetes in people aged <70 is higher in low- and middle-income countries than in high-income countries.<sup>[6]</sup>

In Africa, the prevalence of obesity, diabetes and impaired glucose tolerance has been spreading, and this trend has resulted in the emergence of chronic diseases, including cardiovascular disease, diabetes and cancers in Africa.<sup>[7]</sup> Nonetheless the burden

of diabetes in Africa remains difficult to determine, despite local data on the rapidly changing population structure and the profile of diabetes risk factors.<sup>[7]</sup>

Namibia, like other countries in epidemiological transition, is experiencing an increase in non-communicable diseases. The latest health information system (HIS) results from the Ministry of Health and Social Services (MOHSS) indicate that in 2010, about 4 729 diabetes cases emerged, a figure which had nearly doubled by 2012 to 6 439.<sup>[8]</sup> Mortality due to diabetes is also on the rise in Namibia. An increase of 33.9% in the annual mortality rate (per 100 000 people) from diabetes mellitus, an average of 1.5% per year, has been recorded since 1900.<sup>[9]</sup> Furthermore, a study conducted in Namibia revealed that diabetes was a factor associated with absenteeism, leading to low productivity, in most companies in the country.<sup>[10]</sup> Looking at the magnitude of occurrence of diabetes in Zambezi compared with other regions, the MOHSS indicated an incidence of 4.2% of the population in Zambezi in 2013, while regions such as Kavango recorded 0.7% and Omaheke 2.1, respectively. This simplified overview of the statistics provides some justification for the health education programme in Zambezi region.<sup>[11]</sup>

The development of the programme was based on the encouraging outcome of similar strategies implemented elsewhere. Education programmes have proven to be an effective strategy to reduce the incidence of diabetes globally.<sup>[12]</sup> For example, a programme initiated in Cameroon produced an increase of awareness of 59%.<sup>[12]</sup> The World Health Organization recommends that the best intervention for non-communicable diseases should be effective, cost-effective and affordable.<sup>[13]</sup> On this basis, the researchers reasoned that the development of a health education programme to enhance knowledge regarding the risk factors of diabetes in Zambezi region should be validated for its effectiveness. The purpose of the present study was therefore to evaluate a health education programme that was developed in phase 3 of the overall study, and determine its effectiveness in improving knowledge regarding the risk factors of diabetes in Zambezi region.

A four-phased study was conducted in Zambezi region regarding the risk factors for diabetes. This article is based on the final phase, which evaluated the effectiveness of a health education programme that was developed in phase 3 of the study. Thus, the purpose of this study was to evaluate the effectiveness of the health education programme that was developed to improve knowledge regarding risk factors for diabetes in Zambezi region.

## Methods

### Study design

A quasi-experimental study design with experimental and control groups using pre- as well as post-tests was employed to evaluate the effectiveness of a health education programme to improve knowledge regarding the risk factors of diabetes mellitus in Zambezi region (Namibia).

### Setting

Two groups, namely the control and the experimental group, were selected using purposive sampling. The control group was selected

from Sibbinda, while the experimental group was selected from Katima Urban. Katima Urban and Sibbinda were selected from the four constituencies by means of random sampling.

### Study population and sampling strategy

Purposive sampling was used by the researcher to select participants who were considered to be typical of the population. The researcher opted for purposive sampling such that participants to be included in the study should be  $\geq 18$  years old in each group, and each group should be heterogeneous. Twenty-two participants aged  $\geq 18$  years were conveniently selected from each of Katima Urban and Sibbinda, respectively. The control group (from Sibbinda) comprised 11 women and 11 men. The experimental group from Katima Urban contained 11 women and 11 men.

### Intervention

In order to determine the impact of the programme, two simultaneous non-randomised or non-equivalent groups were formed prior to the implementation of the activities, namely experimental and control groups. Prior to the implementation of the health education sessions with the experimental group, both groups were given a pre-test to determine the current level of knowledge related to the meaning of diabetes, risk factors, signs and symptoms and prevention strategies related to diabetes. After the administration of the pre-test, the intervention was given to the experimental group only in the form of a workshop. The implementation of the educational sessions was followed by the post-test. The same instrument that was used for data collection pre intervention was also used post intervention in both groups. Scores obtained prior to and after the implementation of the programme were compared to measure differences using SPSS (IBM, USA) software.

### Data collection

A checklist was used as a data collection tool. The study instrument (checklist) was divided into sections comprising knowledge on the meaning, risks, signs and symptoms, as well as the prevention of diabetes.

### Data analysis

A paired-sample *t*-test was used to evaluate the difference in the scores by comparing the results within groups pre and post intervention. The increase in scores post intervention shows the effectiveness of the health education programme on knowledge improvement. The checklist was manually checked for completeness. Data entry, editing and analysis were done using SPSS. Means and standard deviations (SDs) of quantitative variables in both groups and between pre- and post-intervention scores were checked by using independent and paired *t*-tests, respectively. The  $\chi^2$  was used as the statistical test of significance between pre- and post-intervention data, with the level of significance set at  $p < 0.05$ .

### Ethical considerations

Approval to conduct a study was sought and obtained from the University of Namibia Postgraduate Research Committee (ref.

no. R132). Additionally, the proposal was reviewed by the School of Public Health Ethical Committee to ensure that principles of non-maleficence, beneficence, autonomy, liberty and justice toward the subjects under investigation would be observed throughout the study. The proposal was as reviewed by the Ministry of Health and Social Services Research Committee, and written permission was granted to interview individuals and conduct focus group discussions with members from the general population of Zambezi region.

## Results

The paired-sample *t*-test was used to measure any change in the level of knowledge regarding the meaning of diabetes between scores before and after the sessions, for the group that received health education sessions. Comparison data are presented in Tables 1 and 2. The tables show that there was a change in scores from pre to post intervention in the level of knowledge regarding the meaning of diabetes. The mean (SD) score for level of knowledge increased from 1.27 to 1.73 (0.456) in the experimental group. There was a significant difference in the scores for level of knowledge pre and post intervention,  $t(21)=3.578, p=0.002$ .

Another significant difference in scores was between levels of knowledge regarding the risk factors for diabetes. A drastic increase in mean score was observed within the experimental group, from 1.18 (0.395) to 1.73 (0.456). There was a significant difference in

score pre and post intervention in the experimental group at  $t(21)=4.294, p=0.000$ .

The level of knowledge regarding the signs and symptoms of diabetes was also evaluated. Mean scores increased post intervention within the group that received the health education sessions. The mean (SD) score of level of knowledge on signs and symptoms before intervention was 1.23 (0.351), and after intervention it was 1.86 (0.429). There was a significant difference between pre- and post-intervention scores from the experimental group at  $t(21)=5.137, p=0.000$ .

Different results were observed between levels of knowledge on prevention strategies for diabetes. However, there was no significant change in the level of knowledge on the prevention strategies for diabetes score before and after the session with the group that received the intervention, at  $t(21)=1.742, p=0.096$ . The mean (SD) score of level of knowledge on the prevention strategies for diabetes before intervention was 1.27 (0.456), and after intervention it was 1.50 (0.512).

## Comparison of mean scores from control group at pre-test and post intervention

The group that did not receive the intervention worked as a control group for the study. The mean scores of the other group at pre-test were compared with post intervention. The reason for comparing these scores was to validate the effectiveness of the health education programme on knowledge improvement.

The mean scores of the following aspects of diabetes were compared pre and post intervention within the control group: level of knowledge on meaning, risk factors, signs and symptoms as well as prevention of diabetes. A paired-sample *t*-test was used to evaluate any change within the control group at pre-test and post-test. Aspects of diabetes such as meaning, risk factors and prevention-strategy correlation and *t* could not be computed because the standard error of the difference was 0. From these data, one can see that comparison within the control group at pre-test and post intervention resulted in the lowest values, which could not be computed.

However, the mean (SD) scores for level of knowledge on signs and symptoms slightly decreased, from pre-test with 1.86 (0.351) to 1.64 (0.492) post intervention. As Table 2 shows, there was no significant difference ( $t=-2.485, p=0.021$ ) within the control group.

## Discussion

The objective of the study was to evaluate the health education programme intervention that was developed and implemented from phase 3. In the present study, the evaluation of the intervention was carried out to validate the effectiveness of the health education programme to be used by health assistants in Zambezi region. The effectiveness of the study was validated by comparing the results of the pre-test with post-intervention scores to determine any change in the level of knowledge regarding various aspects of diabetes.

The meaning of diabetes was assessed as a follow-up question to determine reasons for the poor knowledge of the risk factors of diabetes. The comparison between levels of knowledge of the meaning of diabetes changed significantly at post-intervention level

**Table 1. Comparison of mean scores from experimental group at pre-test and post-intervention test (N=22)**

Factor	Pre-test, mean (SD)	Post-intervention test, mean (SD)
Knowledge of the meaning of diabetes	1.27 (0.456)	1.73 (0.456)
Knowledge of the risk factors of diabetes	1.18 (0.395)	1.73 (0.456)
Knowledge of the signs and symptoms of diabetes	1.23 (0.421)	1.86 (0.351)
Knowledge of the prevention of diabetes	1.27 (0.456)	1.50 (0.512)

SD = standard deviation.

**Table 2. Comparison of mean scores from the control group at pre-test and post-intervention test (N=22)**

Factor	Pre-test, mean (SD)	Post-intervention test, mean (SD)
Knowledge of the meaning of diabetes	1.55 (0.510)	1.55 (0.510)
Knowledge of the risk factors of diabetes	1.68 (0.477)	1.68 (0.477)
Knowledge of the signs and symptoms of diabetes	1.86 (0.351)	1.64 (0.492)
Knowledge of the prevention of diabetes	1.45 (0.510)	1.45 (0.510)

SD = standard deviation.

within the group that received the intervention. The experimental group's knowledge of the meaning of diabetes was observed to be poor at pre-test, but changed significantly to good at post-intervention level.

Based on the results of this study, the mean score of knowledge of the meaning of diabetes after the educational intervention increased. This increase indicates the positive impact of education on improving an individual's knowledge. These findings are compatible with the results of related and similar studies<sup>[14]</sup> that have indicated that the design and implementation of educational programmes can create a significant difference in the improvement of knowledge and attitudes, and enabling and reinforcing factors, for patients before and after intervention.<sup>[15]</sup>

These results seem to be consistent with those of other research<sup>[16]</sup> that found a change within groups from pre-test to post-intervention scores. A study conducted on the effectiveness of a health education intervention on the knowledge of diabetes mellitus found that at the beginning of the study, both groups demonstrated similar levels of knowledge when responding to the questionnaire. The mean percentage of total correct answers was 20.7%, with a minimum of 10 and maximum of 37 points out of a total of 106 points. After the intervention with the experimental group, the increase in disease knowledge was significantly higher among the participants. Another significant change was observed between levels of knowledge on the risk factors of diabetes in the pre- and post-tests. Large changes in levels of knowledge on the risk factors of diabetes occurred. Finally, significant change was observed in the level of knowledge of the risk factors of diabetes from poor to good, at  $p \leq 0.5$ .

## Strengths

The present study identified the impact of a health education programme on improving knowledge regarding risk factors of diabetes in Zambezi region. This impact can be generalised to other programmes of this nature.

## Limitations

The most crucial weakness of the study lies in whether the results can be generalised and applied to other regions of the country. Due to time and financial limitations, it was neither viable nor possible to extend coverage to the entire country. For this reason, the study was conducted solely in Zambezi region. It is therefore recommended that similar research be conducted in other regions in order to design appropriate interventions.

## Conclusion

To sum up, two groups were formed, a control and an experimental group. Both groups were given tests pre intervention to test their knowledge on aspects of diabetes. Thereafter, the experimental group attended sessions on aspects of diabetes. At the end of the sessions, both groups received a post-test to measure any change in knowledge. The results of the experimental and control groups at pre- and post-test were compared using paired-sample *t*-tests.

The results indicated a significant change in levels of knowledge in the experimental group only.

Together, the health education programme improved levels of knowledge of the meaning of diabetes and the risk factors for diabetes within the experimental group. These results demonstrate that the health education programme is effective in improving knowledge of aspects of diabetes. There was no significant change at pre- and post-test within the control group.

**Declaration.** This study was completed as part of ECL's doctoral research.

**Acknowledgements.** The first author would like to thank her supervisor Dr Angula for her assistance during this study, from formulation to completion. The authors would also like to acknowledge the community members of Sibbinda and Katima Urban who participated as interviewees.

**Author contributions.** ECL is first author, and PA provided guidance during the analysis process, and assisted with quasi-experimental design.

**Funding.** None.

**Conflicts of interest.** None.

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Accepted 30 January 2022.