# Teachers' Knowledge of Diabetes and Attitudes towards Diabetic Students in the Primary Schools in Al Baha City in Saudi Arabia

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## ARTICLE INFO

## ABSTRACT

The lifestyle in Saudi Arabia has changed significantly during the last few decades since oil was discovered in 1938. This discovery led to an economic revolution in Saudi Arabia. However, this resulted in people changing their eating habits, which included eating fast food due to their new work responsibilities. Therefore, some chronic diseases such as diabetes, which is one of the most widespread chronic diseases in Saudi Arabia, became more common. This study aims to investigate teachers' attitudes towards diabetic pupils and teachers' knowledge of diabetes as a chronic disease in governmental primary schools in a city in the Kingdom of Saudi Arabia. It is a survey-based research study of the attitudes and teachers' knowledge of diabetes and the research used a quantitative methodology to answer the research questions. The sample of the study consisted of 59 teachers in the governmental primary male schools with mixed background variables of, for example, majors, teaching experiences, and levels of education. The study used a questionnaire in order to achieve research questions. It included two scales: the teachers' knowledge of diabetes and an attitude scale towards diabetic students as well as the items of these two-scale knowledge tests and attitude scale developed by the researcher. The findings demonstrate that there was not a statistical difference between the teachers' knowledge test and their six different majors. On the other hand, the teaching experience had a positive impact on teachers' attitude towards diabetic students. Although the negative correlation between teachers' knowledge of diabetes and their attitude towards diabetic students was small, this value could still suggest a negative correlation. The current study can lead to increased awareness of teachers and educational policy-makers to take into consideration training teachers in some common chronic diseases such as diabetes in the Kingdom of Saudi Arabia.

**Key words:** Diabetes, Attitudes, Teachers' Knowledge, Diabetic Students

## INTRODUCTION

Saudi Arabia is a Middle Eastern country that has 13 provinces. It is the largest country in the Arabian Peninsula covering around 2,250,000 square kilometers. It has more than 36000 public schools in these 13 provinces and more than 5,816,755 children aged between 5 and 19 years old (Saudi General Authority of Statistics, 2017).

Diabetes is a chronic disease that makes the human being feel debilitated because the insulin in the body is not sufficient (World Health Organization, 2016). Additionally, there are two common types of diabetes, type 1 and type 2. In diabetes type 1, beta cells in the pancreas cannot introduce insulin into the body or they can only introduce a small amount of it because the immune system mistakenly kills these cells (Ministry of Health, 2018). For that reason, the body cannot use sugar or blood glucose. On the other hand, diabetes type 2 is caused by a lack of insulin in the body because the beta cells cannot produce enough insulin in the body or the body cannot use the insulin effectively because there is an insulin sensitivity (Ministry of Health, 2018).

Diabetes is a widespread disease in the world. McCarthy, Lindgren, Mengeling, Tsalikian, and Engvall, (2002) found that diabetes type 1 can occur in nearly 1 in 800 children. In a recent study, it has been estimated that the number of diabetic people will be 591.9 million worldwide in 2035 (Whiting, Guariguata Weil & Shaw, 2011). In Saudi Arabia, the prevalence of the two types of diabetes in 2030 is expected to jump to 20.8% from 16.2% (Whiting et al., 2011). In Saudi Arabia, the percentage of diabetes among children is approximately 5%, with the Ministry of Health in Saudi Arabia (2016) indicating that approximately 187.108 children suffered from diabetes in 2016. It is clear, the number of children who are between 5 and 19 are 5,816,755; the estimated number of diabetic students may therefore be around 290,887,75. This means that it is possible to find a diabetic student in each school in Saudi Arabia.

Regarding the effects of diabetes on students' learning, McCarthy et al. (2002) found that diabetes is not associat-

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ed with low student performance. Their study involved 244 diabetic students who were diagnosed with type 1 diabetes in a midwestern state in the US. Crump, Rivera, London, Landau, Erlendson, and Rodriguez (2013) found a relationship between chronic disease such as diabetes and low performance in maths and English. This relationship may have contributed to the health conditions that diabetic students can suffer from such as headache, vision disorders, and confusion. Kucera, and Sullivan (2011) also concluded that low performance in learning was due to the variance of blood glucose and not due to any disorder of the brain. This variance of blood sugar can cause some health disorders as mentioned above. It seems that it is difficult to identify the effect of some kinds of chronic disease such as diabetes on educational performance because there is a lack of studies in this field. Additionally, Riner and Sellhorst (2013) suggest that most studies have investigated the physical effects of chronic disease in children, but there are fewer studies that have explored the students' cognitive field relating to areas such as school performance.

Teachers' knowledge of diabetes is core information that is needed to deal with diabetic students because they need special care at school. Most recently, the study by Al Duraywish and Nail (2017) revealed that 56.22% of teachers in Al Jouf province in the north of Saudi Arabia may not have had enough knowledge about diabetes. The greatest concern in this study is that in this province, there are more than 490 diabetic students. One final noteworthy point is that in Saudi Arabia, diabetic students are not considered as special need students. As a consequence, teachers in governmental schools may not take any kind of training in diabetes. This may affect how they deal with diabetic students when they need any kind of help such as dealing with hypo-blood sugar or high blood sugar, which are the most two common syndromes of diabetes.

## Objectives

The main aim of this small study was to investigate teachers' attitudes towards diabetic students and teachers' diabetes knowledge in primary schools in Al Baha city in Saudi Arabia.

## Null Hypotheses

The study aimed to assess the four following hypotheses:

H01: There will be no statistically significant difference between the levels of knowledge of diabetes held by teachers and their different major. Based on the above hypothesis, the independent variable is considered teachers' majors, which consisted of six majors (Islamic Studies, Arabic, Science, Mathematics, English, Others) but the dependent variable is the level of knowledge of diabetes.

H02: There will be no statistically significant difference between the attitudes towards diabetic students held by teachers who have little teaching experience and teachers who have more teaching experience.

H03: Teachers' knowledge of diabetes will not be statistically predictable based upon their attitudes towards diabetic students, their teaching experience and their major.

H04: There will be not a significant correlation between teachers' knowledge of diabetes and attitude towards diabetic students held by teachers.

## METHODS

In the light of the research aim, a survey research design was adopted to investigate teachers' attitudes towards diabetic students and teachers' diabetes knowledge in primary schools in Al Baha city in Saudi Arabia.

## Sampling and Participants

The suitability of sampling to the research methodology and instrumentation is one pillar of research quality. (Cohen, Manion, & Morrison, 2015). Convenience sampling was adopted in the study because generalization was not the goal of this small study. Creswell (2005) states that convenience sampling may provide useful information to answer the research questions and test hypotheses. Because the hypotheses of this study consisted of correlational, causal and predictable relationships, two groups of teachers at two primary schools from Al Baha city center were used in the current study. These two schools were selected due to the high number of diabetic students. Further, both schools are located in the city center. The total number of teachers in these two schools is 82 teachers. Participants in this study consisted of 59 male teachers out of 82 teachers because there is a segregation between boys' and girls' schools in Saudi Arabia. Of these participants, 77.2% have a bachelor's degree, 15.8% have a master's degree and 80.7% of them had more than five years' teaching experience. Access to the participants was made possible through the General Directorate of Education in Al Baha region (Teachers Affairs).

## Data Collection Procedures

After the instruments of the study were designed by the researcher and the validity was ensured through specialists in the education and medical fields, each item was translated into Arabic language because this was the official language of the participants. Additionally, the instruments were sent to three referees to check the equivalence of translating; one of these referees works as a senior doctor at King Fahad Hospital in Al Baha province. The knowledge test and the Attitude Scale were piloted by three participants. After taking their opinion into account and correcting the questionnaire, the research instruments were transferred to an online questionnaire through Google Docs with a brief introduction. Furthermore, the link of the online questionnaire was sent to the headmasters of the two schools in Al Baha city. Finally, after two weeks of sending an online questionnaire link to the participants, the stage of data collection and analyzing was started.

## Ethical Considerations

In this study, the researcher let participants know about the aims of the study and the study questions that the re-

search would use. It was important to tell the participants about the objectives that the researcher wanted to achieve and also the procedures of the study before applying the research (Pring, 2015). The participants were adults because teachers are the sample of the study. Furthermore, as was clear in the introduction of the two instruments of the study, the information of the participants in this study will not be shared with others and the participants' names were not necessary. Cohen et al. (2015) concluded that in social research, it is important to take account of the effect of research on the participants.

Due to the official language in Saudi Arabia being Arabic, the researcher translated the study instruments, i.e., the questionnaire and the Knowledge Scale, from English language to Arabic language (Appendix B). In this regard, two experts in translation revised the translation of the questionnaire and the Knowledge Scale. In addition, the researcher translated the Arabic copies into English again to verify the equivalence between the Arabic and English copies.

One more noteworthy point is that the Certificate of Ethical Approval from Exeter University was issued before the data was collected from the participants. Finally, Bradburn and Sundman (1979) indicate that one of the disadvantages of a questionnaire can be if it includes sensitive questions. Thus, this questionnaire does not include any sensitive questions.

## Design of the Instruments

The online questionnaire was divided into three sections, part 1: participants' background information; part 2: attitude toward diabetic students that consisted of (20) items for the degree of agreement of responses; and part 3: knowledge of diabetes test also consisting of 20 multiple-choice questions (Appendices A & B).

## Operationalization of the Constructs

To answer the questions of the study, the following instruments were designed:

The first part of the questionnaire was the Knowledge Scale to measure teachers' knowledge of diabetes at governmental primary schools in Al Baha city in Saudi Arabia. The teachers' knowledge test aimed to investigate the teachers' knowledge of diabetes mellitus generally. It consisted of (20) items to identify the teachers' knowledge of diabetes. All these questions were multiple choice; each question had four choices. There was one choice that was right and three wrong choices. The high mark indicated a higher knowledge of teachers regarding the diabetes disease. On the other hand, a low score in the teachers' knowledge test pointed at the lack of information toward diabetes and dealing with diabetic students. Also, teachers' attitudes towards diabetic students was the second part in the questionnaire in this study.

In this small-scale inquiry, the study used an online questionnaire that consisted of (20) Likert Scale items for the degree of agreement of responses. Participants were asked to each select their response as follows: (1) Strongly disagree; (2) Disagree (3); Neutral; (4) Agree; (5) Strongly

agree. The total score on this scale is between 20 and 100. The highest score on this scale indicated a positive attitude towards diabetic students in primary schools and the lowest score on the scale indicated a negative attitude towards them (Appendix A).

The three categories of background data of participant were collected:
1. Level of education: Participant chose from the degrees: Diploma, Bachelor, Master, or Ph.D.
2. Teaching experience: Participant chose from the categories: 0-5 years, 6-10 years, 11-15 years, 16-20 years, over 21 years.
3. Major: Participant chose from the subjects: Islamic Studies, Arabic, Science, Mathematics, English, Others.

## Validity of the Instruments

The study instruments were introduced to a group of specialists in teaching methods, supervision of English language and two diabetes specialists. The first one was an assistant professor at Al Baha University in the curriculum and instruction department. He has significant experience in teaching and lecturing at universities that spans more than 11 years. The second expert was a supervisor in Al Baha Education Supervision in the English Department. He has a master's degree in TESOL, and 19 years' teaching and supervision experience. The third referee was an associate professor in the Medical College at Al Baha University and the chairman of the diabetes center at King Fahad Hospital. The final expert was a PhD candidate in the Medical College at Exeter University. He has an interest in childhood diabetes. The researcher took their opinions into consideration to determine the final draft of the study instruments. They suggested paraphrasing three items from the questionnaire (5,6,17) and they also recommended reworking seven questions in the knowledge test (5,9,10,11,13,15,14).

## The Reliability of the Instruments

### Reliability of the attitude scale

The value of Alpha Cronbach's Attitude Scale was found to be = (0.763). It was concluded that the tool was acceptable, and reliable to be used as a tool for this study. George and Mallery (2003, 231) indicate that (7) is an acceptable reliability value. In addition, the Item-Total Statistics indicated that if item 19 had been deleted Cronbach's Alpha may have increased to .810. Although deleting this item could have slightly raised the reliability, leaving item 19 to redevelop this Attitude Scale in the future rather than improving internal consistency. As a sequence, the Attitude Scale as suggested by George and Mallery (2003) is acceptable and has stability.

### Reliability of knowledge test

The knowledge test was estimated using test-retest methods. The Spearman correlation coefficient was used to measure the correlation between the test and its retest. It was 0.682. It

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was concluded that the knowledge test had acceptable reliability because it was close to (0.7). It was clear in Item-Total Statistics that deleting question 15 could have raised the reliability to .694 but it was still below the acceptable level. Because of this, the item was kept as it was.

## RESULTS

### Explanatory Data Analysis Results

#### Normality of the attitude scale

Checking on the normality test is a core statistical method before testing hypotheses to determine which statistics should be used in analyzing data, i.e., parametric or non-parametric statistics. The histogram below in Figure 1 shows that the Attitude Scale towards diabetic students has a normal distribution. The result of the Kolmogorov-Smirnov test was 0.200. This means the result of normality of the Attitude Scale could be normal because of the value of $p<.05$.
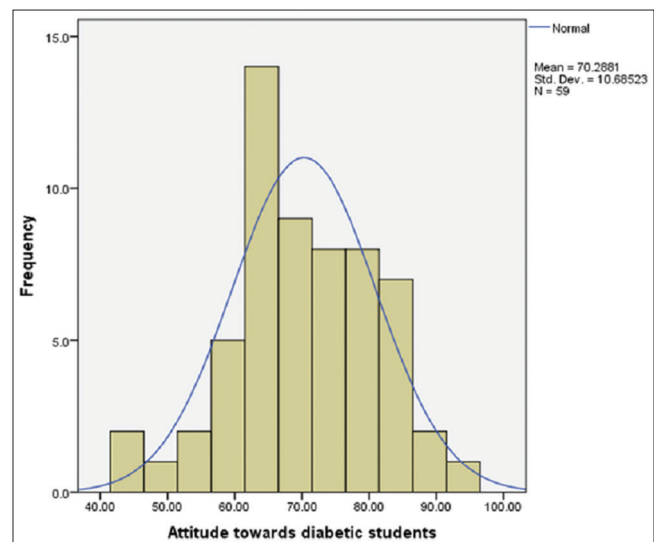


**Figure 1.** Histogram of total Attitude Scale data

#### Normality of the knowledge scale

The following histogram in Figure 2 shows normality on the Knowledge Scale. The value of the Kolmogorov-Smirnov test was 0.181. This means that the data in the Knowledge Scale has a normal distribution because the p value is more than $<0.05$. As sequences, parametric statistics were used to test the hypotheses.
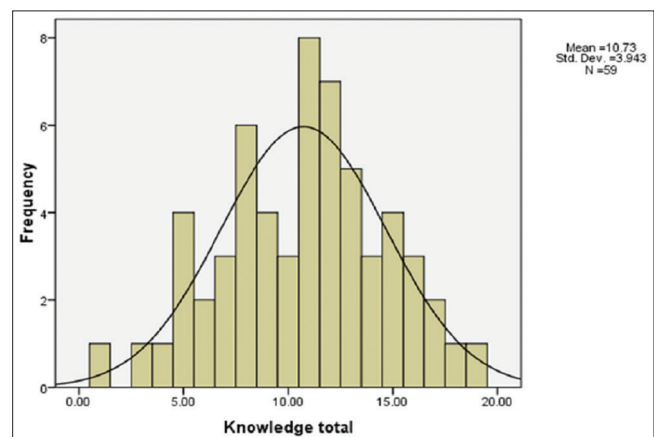
#### Homogeneity of variance

To verify the homogeneity of variance between the two groups for both attitude and knowledge scores, Levene's test was used. Both scores were more than .05; Attitude Scale = 0.824, Knowledge Scale = 0.234 and the Sigs were also more than 0.05. This indicated that there is a significant homogeneity between groups and there is an assumption of homogeneity of variance.



**Figure 2.** Histogram of total Knowledge Scale data

the null hypothesis was accepted and the alternative hypothesis was rejected.

### Contribution of Teachers' Majors to Differences in their Levels of Knowledge of Diabetes

H01: There will be no statistically significant difference between the levels of knowledge of diabetes held by teachers and their different major.

To test this hypothesis, one-way ANOVA between a group's analysis of variance was used to explore the impact of a major on the level of teachers' knowledge of diabetes, which was measured by a knowledge test of diabetes. The results are in the following Table 1. Levene's test was used to make sure of the homogeneity of variance in the group scores. Table 2 shows that there is a homogeneity of variance in scores because Sig is 0.125, which means it is more than .05.

As shown in Table 2, there were no statistically significant differences at $p < .05$ level in the Knowledge Scale of diabetes of the six major groups: $F (5,53) = 2.075$, p=.083. This means that different majors such as Islamic Studies, Arabic, Science, Mathematics, and English did not have any impact on the teachers' knowledge of diabetes. Therefore,

### Contribution of Teachers' Experience to Differences in their Attitudes towards Diabetic Students

H02: There will be no statistically significant difference between the attitudes towards diabetic students held by teachers who have little teaching experience and teachers who have more teaching experience.

To test this hypothesis, one-way ANOVA between groups' analysis of variance was used to explore the impact of teaching experience, which was measured by the Attitude Scale. The results are in the following Tables 3 and 4. Levene's test was used to ensure there was homogeneity of variance in the scores of the groups. Table 3 below shows that there was a homogeneity of variance in the scores because the Sig. was .080, which means it was greater than .05.

Table 4 indicated that there were statistically significant differences at $p > .05$ level in the Attitude Scale of diabetes for the five experience categories: $F (4,54) = 9.442$, p.000; this means that different experience years in teaching impacted on the teachers' attitudes towards diabetic students. The subjects were

divided into five groups according to their teaching experience (0-5 years; 6-10 years; 11-15 years; 16-20 years; and over 21 years). An Eta square formula was used to calculate the effect size by using the following formulas (Pallant, 2007).

The result of the effect size was 0.41. This means that the effect size was a high effect, according to Cohen (2015, 284-287). He divided the effect size into three classifications as shown in Table 5:

**Table 1.** Test of homogeneity of variances of knowledge scale

| Levene statistic | df1 | df2 | Sig. |
|---|---|---|---|
| 1.820 | 5 | 53 | 0.125 |

**Table 2.** Comparison of teachers' levels of knowledge of diabetes with reference to their majors

| | Sum of squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 126.106 | 5 | 25.221 | 2.075 | 0.083 |
| Within Groups | 644.301 | 53 | 12.157 | | |
| Total | 770.407 | 58 | | | |

**Table 3. Test of homogeneity of variances of the attitude scale**

| Levene statistic | df1 | df2 | Sig. |
|---|---|---|---|
| 2.206 | 4 | 54 | 0.080 |

**Table 4.** Comparison teachers' attitude towards diabetic students with reference to their teaching experience

| | Sum of squares | df | Mean square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 2725.305 | 4 | 681.326 | 9.442 | 0.000 |
| Within Groups | 3896.797 | 54 | 72.163 | | |
| Total | 6622.102 | 58 | | | |

**Table 5.** The criteria of the effect size

| Scale | The significance of effect size | | |
|---|---|---|---|
| | Small | Medium | Large |
| $\eta 2$ | 0.01 | 0.06 | 0.14 |

**Table 6.** Relates to the hypothesis three which aims to investigate teachers' knowledge of diabetes will not be statistically predictable based upon their attitude towards diabetic students, their teaching experiences and major.

| Model summary | | | | |
|---|---|---|---|---|
| Model | R | R square | Adjusted R square | Std. error of the estimate |
| 1 | 0.222a | 0.049 | -0.002 | 3.64900 |

a. Predictors: (Constant), Attitude towards diabetic students, Major, Experience

Also, a POST – HOC comparison using the Tukey HSD test indicated that the mean scores for group 2 (M=69.5, SD=15.66) were significantly different from group 3 (M=66.4, SD=8.3); and group 4 (M= 67.23, SD=7.01). However, group 1 (M= 46.5, SD=3.53) did not differ significantly from the other groups 1,2,3,4, or 5.

Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted.

**A Predictable Contribution of teachers' Attitude towards Diabetic Students, their Teaching Experiences and Major to Differences in their Levels of Knowledge of Diabetes**

H03: Teachers' knowledge of diabetes will not be statistically predictable based upon their attitude towards diabetic students, their teaching experiences and major.

As shown in Table 7, a regression regression was calculated to predict teachers' knowledge of diabetes based on their attitudes towards diabetic students, their teaching experiences and their major. A significant regression equation was not found ($F (3,55) = .953, p = .421$), with an R2 of.049 as shown in Table 6. The R2 value indicates that the model (which includes experience, majors, and attitude) explains 4.9% of the variance in perceived knowledge of diabetes. This value is very small; therefore, it is considered as a poor fit, in line with Muijs' (2004) observation.

As shown in Table 8, Participants' predicted teachers' knowledge of diabetes was equal to 7.572 + (-445) (Experience) +.439 (Major) +.026 (Attitude) scores teachers' knowledge of diabetes when teaching experiences, major, and attitude towards diabetic students were measured. Teachers' knowledge of diabetes increased scores for teaching experience, major, and attitude towards diabetic students.

**A Correlation Contribution of Teachers' Knowledge of Diabetes to Differences in their Attitude towards Diabetic Students**

H04: Teachers' knowledge of diabetes will correlate significantly with their attitude towards diabetic students.

To identify the correlation between the teachers' knowledge of diabetes and their attitude towards diabetic students, a two-tailed Pearson correlation coefficient was conducted. Table 9 shows that the relationship between teachers' knowledge of diabetes (as measured by the knowledge test) and their attitude towards diabetic students (as measured by the Attitude Scale) had a slightly negative correlation between these two variables: r= -.001, n=59, p=.991. This means that there was a statistically significant correlation between the teachers' knowledge of diabetes and their attitude towards diabetic students. It is clear that the correlation value is -0.001, which means that it is close to value 0. This is difficult to interpret as a low negative correlation between the teachers' knowledge of diabetes and their attitude towards diabetic students. According to Cohen et al. (2015) a small correlation ranging from 0.2 to 0.35 is the a very slight relationship between variables thought may be

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**Table 7.** Regression ANOVA result for teachers' knowledge of diabetes will be predictable based upon their attitude towards diabetic students, their teaching experience and major

| ANOVA | | | | | |
|---|---|---|---|---|---|
| **Model** | **Sum of squares** | **df** | **Mean square** | **F** | **Sig.** |
| 1 | | | | | |
| Regression | 38.073 | 3 | 12.691 | 0.953 | 0.421b |
| Residual | 732.334 | 55 | 13.315 | | |
| Total | 770.407 | 58 | | | |

a. Dependent variable: Knowledge total
b. Predictors: (Constant), Attitude towards diabetic students, Major, Experience

**Table 8.** Regression coefficients results for a predictable contribution of teachers' attitude towards diabetic students to differences in their levels of knowledge of diabetes, their teaching experiences and major coefficients

| Model | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
|---|---|---|---|---|---|
| | **B** | **Std. Error** | **Beta** | | |
| 1 | | | | | |
| (Constant) | 7.572 | 3.393 | | 2.231 | 0.030 |
| Experience | -0.445- | 0.522 | -0.136- | -0.852- | 0.398 |
| Major | 0.439 | 0.274 | 0.215 | 1.603 | 0.115 |
| Attitude Total | 0.026 | 0.054 | 0.077 | 0.491 | 0.625 |

**Table 9.** Correlations between knowledge scale and attitude scale

| | Knowledge total | Attitude total |
|---|---|---|
| Knowledge Total | | |
| Pearson Correlation | 1 | -0.001- |
| Sig. (2-tailed) | | 0.991 |
| N | 59 | 59 |
| Attitude Total | | |
| Pearson Correlation | -0.001- | 1 |
| Sig. (2-tailed) | 0.991 | |
| N | 59 | 59 |

statistically significant, but in this case, it is smaller than Cohen's Scale.

## DISCUSSION

This study detected several results of investigating teachers' knowledge of diabetes and their attitude towards diabetic students in Al Baha city in the Kingdom of Saudi Arabia. The current study consisted of four hypotheses and all of these were tested. The first aim of this study was to determine the relationship between teachers' knowledge of diabetes in primary schools and their attitude towards diabetic students. The current study suggests that there were no significant differences in the level of teachers' knowledge of diabetes attributed to their different majors. This means that the six different majors (Islamic Studies, Arabic, Science, Mathematics, and English and Others) cannot have had any impact on teachers' knowledge of diabetes.

The second interesting result is that teaching experience plays a role in teacher's attitude towards diabetic students. It is clear that the effect of teaching experience among five groups was seen in group two, which had between 6-10 years'

experience. Wolters and Daugherty (2007) indicate that more teaching experience could affect some teaching aspects such as goal structures, beliefs, motivational attitude and efficiency. Moreover, it is clear that the background information, namely, teachers' knowledge of diabetes and attitude towards diabetic students and teaching experience, had a significant impact.

Additionally, the third result of hypothesis three indicated that the prediction of teachers' knowledge of diabetes was based on attitude towards diabetic students, teaching experience and major. Although the regression value was 4.9% of the variance in perceived knowledge of diabetes, this result indicated the small and poor fit of predicting teachers' knowledge of diabetes based on the attitude towards diabetic students, teaching experience and major. This result should be regarded as limited because the multiple regression takes account of the sample size, as Cohen et al. (2015) point out. The underlying reasons for the poor fit of the regression are that there the analysis of variance between teachers' knowledge of diabetes and majors was not statistically significant as mentioned in hypothesis one, and there was little negative correlation between the knowledge test and attitude towards diabetic students. Therefore, it can be concluded that this result is limited.

Finally, the last hypothesis' results confirmed a negative correlation between the teachers' attitudes towards diabetic students and their knowledge of diabetes. Despite this negative correlation, this result is very close to zero, which indicates there is no correlation between them. Furthermore, Allinder (2005) indicates that in the United States, teachers' knowledge of any chronic disease is limited but it could not include any correlation between knowledge and attitude as the study of Hellinger, Hosseingholizadeh, Hashemi, and Kouhsari (2017) found that there is a positive correlation between knowledge, teaching experience and attitude generally.

## CONCLUSION

In conclusion, in the current study aimed at investigating teachers' knowledge of diabetes and their attitudes towards diabetic students in primary schools in Al Baha schools, the results suggest a highly significant difference in attitudes towards diabetic students in terms of teaching experience. However, the results did not suggest any relationship between levels of the knowledge test of diabetes and teachers' majors. Furthermore, in the light of the result of the correlation between the knowledge test results and attitudes toward diabetic students, and a slightly significant regression among attitude, majors, and experience as independent variables and a knowledge test as a dependent variable, it is critical that further attention is given to these variables. There is a demand for studies that evaluate teachers' knowledge and their attitudes towards students who have any kinds of chronic disease such as diabetes in the governmental schools in Saudi Arabia. In this study, several limitations should be taken into consideration. The sample was selected purposively because the time was limited, and this study did not aim to generalise the results as the sample size was very small. For further research, selecting a representative sample randomly may raise the accuracy of the results. Furthermore, the participants were from one city in Saudi Arabia located in the south of the Kingdom. Therefore, it is possible that there was not enough cultural and, ethnic diversity in the participants, because this city is located on the highest mountain in the south of Saudi Arabia and most of the teachers are considered to be the original people of this city. Moreover, gender needs to be taken into account in further research because this study was limited to the male teachers in primary schools. Also, the stage of the school could be expanded to include the remaining two educational stages in Saudi Arabia: intermediate and secondary schools. Additionally, although the instruments of this study indicated acceptable validity and reliability, they can be developed by improving some items in the knowledge test and Attitude Scale that could raise the reliability of the tools. This could be clearer in Cronbach's Alpha if some items are detected in both instruments of the study. Finally, with regard to distributing the study instruments, the questionnaire was administered by an online survey. This may have affected the participants' responses as if they had injuries, they might not have answered themselves (Dale, 2006).

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## APPENDIX

**Appendix A: Questionnaire**

Dear participant,

I am a Ph.D. candidate at Exeter University, and I am conducting a study of an investigation of primary teachers' knowledge and attitude toward diabetic students in Saudi Arabia. The main objective of this study is that exploring teachers' knowledge and attitude toward diabetic students in primary Saudi government schools in Al Baha city.

There is a brief questionnaire that asks a variety questions about your attitude towards diabetes. Your name is not necessary to write it on questionnaire because I don't need to know who you are, and no one will know whether you in this study.

I hope you will take a few minutes to complete this questionnaire. I appreciate your efforts and your voluntary to be a participant in my study.

Please tick (√) in the suitable degree of agreement and circle the correct answer in the knowledge test.

Key: 5= Strongly agree 4= Agree, 3= Neutral, 2= Disagree, 1= Strongly disagree

Thanks a lot for your cooperation.
Sincerely
Mohammed Al Zahrani
E-mail/alahmadim2010@gmail.com
Mobile/07770164307

**An investigation of Teachers' knowledge of diabetes and attitude toward diabetic students in the primary schools in Saudi Arabia**

This questionnaire aims to investigate teacher's knowledge of and attitude towards diabetic students in Al Baha city center primary schools.

**Part A: Personal Details**

1- What is your level of education?
   Diploma ☐
   Bachelor ☐
   Master ☐
   PhD` ☐

2- How old your teaching Experiences?
   0-5 years ☐
   6-10 years ☐
   11-15 years ☐
   16-20 years ☐
   Over 21 years ☐

3- What is your major?
   Islamic ☐
   Arabic ☐
   Science ☐
   Mathematics ☐
   English ☐
   Others ☐

**How well do these items describe your attitude towards diabetic students?**

This questionnaire consists of 20 statements. Please tick (√) in the suitable degree of agreement.

**5= Strongly agree 4= Agree, 3= Neutral, 2= Disagree, 1= Strongly disagree**

| No | Items | Degree of agreement | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Diabetes has a little impact on the student's achievement | | | | | |
| 2 | Blurred vision is an impact of diabetes. | | | | | |
| 3 | I consider diabetic students as special needs | | | | | |
| 4 | I am worried when a diabetic student in my class | | | | | |
| 5 | There are many procedures that I personally can take to reduce the effects of diabetes. | | | | | |
| 6 | There are students' issues more important than diabetes. | | | | | |
| 7 | I try to expand my awareness of Diabetes through reading. | | | | | |
| 8 | I worry a lot about the impact of diabetes. | | | | | |
| 9 | I have a little interest in increasing my knowledge of diabetes. | | | | | |
| 10 | I deal with a diabetic student in my class carefully. | | | | | |
| 11 | Diabetic students make problems with their friends. | | | | | |
| 12 | I realize the diabetes can affect of students pay attention during a lesson. | | | | | |
| 13 | I ask diabetic students to check blood test level before starting the session. | | | | | |
| 14 | I would like to help my diabetic students | | | | | |
| 15 | I would like to learn more about diabetes to help my students | | | | | |
| 16 | Diabetic students do not need any kind of help | | | | | |
| 17 | I do not differentiate between normal students and diabetic in educational tasks. | | | | | |
| 18 | Diabetic students make me feel confused | | | | | |
| 19 | I use some examples to raise students' awareness towards diabetes | | | | | |
| 20 | I know insulin is required for diabetes type 1 patient | | | | | |

**Personal opinions and comments**

Please leave your personal opinions and comments in this section.

**Part B: : Knowledge Test.**

This knowledge test consists of 20 questions. All questions are multiple-choice.
Please circle the correct answer from the choices.

1- What is a diabetes disease?
   a. A kidney disease
   b. The body has not enough calcium
   c. Lack of oxygen
   d. The body has not enough insulin

2- How many common types of diabetes?
   a. Two types
   b. Three types
   c. Four types
   d. Five types

3- What are the symptoms of diabetes from these choices?
   a. Autism
   b. Extreme hunger and Excessive thirst
   c. Bleeding and dizzy
   d. High fever and sore throat

4- What is the definition of type 1 diabetes?
   a. Non-insulin-dependent diabetes
   b. Adult diabetes.
   c. Insulin-dependent diabetes
   d. Chronic disease suffers from ears

5- The normal blood sugar range when a healthy person fasten is:
   a. Between 4.0 to 6.0 mmol/L
   b. Between 7.0 to 9.0 mmol/L
   c. Between 10.0 to 12.0 mmol/L
   d. Between 13.0 to 15.0 mmol/L

6- The random blood sugar range in diagnosing diabetes is:
   a. 5.0 mmol/L.
   b. 9.0 mmol/L.
   c. Less than 10.1 mmol/L.
   d. More than 11.1 mmol/L.

7- What does the HbA1C test mean?
   a. A test to measure the level of blood glucose at one week.
   b. A test to measure the level of blood glucose at two weeks.
   c. A test to measure the level of blood glucose at three weeks.
   d. A test to measure the level of blood glucose at two to three months.

8- Which one choice is not related to diabetes complications?
   a. Kidney disease.
   b. Heart disease.
   c. Stroke.
   d. Caner.

9- What is the cells' name that produces insulin?
   a- Beta cells of the pancreas.
   b- Tongue cells.
   c- Epidermis.
   d- Nucleus cells.

10- Which one of the common cause of type 2 diabetes?
   a. Heavy exercise.
   b. Dietetics
   c. Obesity.
   d. High fever.

11- What does hypoglycaemia mean?
   a. High blood Glucose.
   b. Low insulin in blood.
   c. Normal blood sugar.
   d. Low blood Glucose.

12- Which of the following is not considered as low blood sugar sings?
   a. Hungry and unconsciousness.
   b. Dizziness and headache.
   c. Sweaty and Nervous.
   d. Increase thirst.

13- Which of the following is considered as high blood sugar sings?
   a. Frequent urination.
   b. Hungry.
   c. Hyperactivity
   d. Energetic student.

14- What is the right procedure from the following when someone has a low blood sugar?
    a.   Give him/her tablespoon of sugar.
    b.   Give him/her a cup of water.
    c.   Give him/her food without carbohydrate.
    d.   Give him/her fruits

15- What is the cause of low blood sugar from the following?
    a.   Eating much food.
    b.   Drinking soda.
    c.   Doing exercise.
    d.   Did not taking enough insulin.

16- What does type 2 diabetes mean?
    a.   Non-insulin-dependent diabetes
    b.   Pregnancy diabetes.
    c.   Insulin-dependent diabetes
    d.   Children diabetes.

17- What is the job of insulin?
    a.   To transmute carbohydrate into protein.
    b.   To transmute sugar into vitamin.
    c.   To transmute sugar from blood into body's cells.
    d.   To transmute protein into minerals.

18- Does diabetes contagious disease?
    a.   Yes
    b.   No
    c.   I do not know.

19- When Glucagon medicine is used?
    a.   Treat high blood sugar.
    b.   Treat low blood sugar.
    c.   Treat heart disease.
    d.   Treat lack of insulin.

20- Which is considered as the common problems of diabetic people:
    a.   Foot problems
    b.   Tongue problems.
    c.   Nails problems.
    d.   Hair problems.

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**Appendix B: Questionnaire (Arabic version)**

**العنوان: تقصي معرفة معلمي المرحلة الابتدائية واتجاهاتهم نحو الطلاب السكريين بالمملكة العربية السعودية.**

يهدف هذا الاستبيان إلى تقصي معرفة معلمي المرحلة الابتدائية واتجاهاتهم نحو الطلاب السكريين بالمملكة العربية السعودية بمدينة الباحة مركز الوسط.

أ.    البيانات الشخصية.

**1. المستوى التعليمي؟**

| | |
|---|---|
| ☐ | دبلوم |
| ☐ | بكالوريوس |
| ☐ | ماجستير |
| ☐ | دكتوراه |

**2. سنوات الخبرة التعليمية.**

| | |
|---|---|
| ☐ | 1- 0-5 سنوات |
| ☐ | 2- 6-10 سنوات |
| ☐ | 3- 11-15 سنة |
| ☐ | 4- 16-20 سنة |
| ☐ | 5- أكثر من 21 سنة |

**3. التخصص العلمي الدقيق**

| | |
|---|---|
| ☐ | 1. إسلامية |
| ☐ | 2. لغة عربية |
| ☐ | 3. علوم |
| ☐ | 4. رياضيات |
| ☐ | 5. لغة انجليزية |
| ☐ | 6. غيرها |

ب. قياس الاتجاه.

فضلاً ضع علامة (✓) تحت العبارة التي تراها مناسبة لرأيك.

1= غير موافق بشدة، 2= غير موافق، 3= محايد، 4= موافق، 5= موافق بشدة

| درجة الموافقة | | | | | العبارة | رقم |
|---|---|---|---|---|---|---|
| 5 | 4 | 3 | 2 | 1 | | |
| | | | | | مرض السكر يؤثر تأثيرا بسيطاً على تحصيل الطالب الأكاديمي. | 1 |
| | | | | | اضطراب البصر (الرؤية) يعد من اعراض مرض السكر. | 2 |
| | | | | | اعتبر طلاب السكري من ذوي صعوبات التعلم. | 3 |
| | | | | | أقلق عندما يكون بالفصل طالب سكري. | 4 |
| | | | | | هناك العديد من الإجراءات التي اتخذها للتقليل من أعراض السكري الجانبية. | 5 |
| | | | | | هناك مشاكل طلابية أكثر أهمية من السكري. | 6 |
| | | | | | أحاول من خلال القراءة توسيع معرفتي بالسكري. | 7 |
| | | | | | أقلق كثيراً من الأعراض الجانبية للسكري. | 8 |
| | | | | | لدي اهتمام بسيط بزيادة معرفتي بالسكري. | 9 |
| | | | | | أتعامل مع طلاب السكري بفصلي بعانية. | 10 |
| | | | | | يخلق طلاب السكري المشاكل مع زملائهم. | 11 |
| | | | | | أدرك بأن مرض السكري يؤثر على الانتباه خلال الحصة. | 12 |
| | | | | | أطلب من الطلاب السكريين أن يقيسوا مستوى السكر بالدم قبل بدء الحصة. | 13 |
| | | | | | أود أن أساعد طلابي السكريين. | 14 |
| | | | | | أرغب أن أتعلم أكثر عن السكر لأساعد طلابي. | 15 |
| | | | | | الطلاب السكريين لا يحتاجون لأي نوع من المساعدة. | 16 |
| | | | | | لا أفرق بين الطلاب العاديين والطلاب السكريين في المهام التعليمية. | 17 |
| | | | | | يجعلني الطلاب السكريين متوتراً. | 18 |
| | | | | | استخدم بعض الأمثلة لزيادة الوعي لدى الطلاب تجاه السكري. | 19 |
| | | | | | أعرف بأن الأنسولين ضروري لمصابي السكر النوع الأول. | 20 |

ج. قياس المعرفة.

يتألف هذا الاختبار من 20 سؤال عبارة عن اختيارات متعددة. فضلا اختر الإجابة الصحيحة بوضع دائرة عليها. ١

**5. ما هو مرض السكري؟**

أ. مرض الكلى

ب. لا يوجد بالجسم كالسيوم كافٍ.

ت. قلة الاكسجين.

ث. لا يوجد بالجسم أنسولين كافٍ.

**6. كم نوع شائعة لمرض السكري؟**

أ. نوعين.

ب. ثلاثة أنواع.

ت. أربعة أنواع.

ث. خمسة أنواع.

**7. ماهي أعراض السكري من الاختيارات التالية:**

أ. التوحد

ب. الجوع والعطش الشديدين.

ت. النزيف والدوار.

ث. ارتفاع درجة الحرارة والتهاب الحلق.

**8. ما هو تعريف السكر النوع الأول؟**

أ. السكر الغير معتمد على الأنسولين.

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ب. سكر البالغين.

ت. السكر المعتمد على الأنسولين.

ث. مرض مزمن يصيب الأذن.

**9. لمستوى الطبيعي لسكر الدم للشخص السليم الصائم يتراوح ما بين:**

أ. 4.0 إلى 6.0 mmol/L

ب. 7.0 إلى 9.0 mmol/L

ت. 10.0 إلى 12.0 mmol/L

ث. 13.0 إلى 15.0 mmol/L

**10. المستوى العشوائي لسكر الدم للشخص المصاب بالسكري يتراوح ما بين:**

أ. 5.0 mmol/L

ب. 9.0 mmol/L

ت. أقل من 10.1 mmol/L

ث. أكبر من 11.1 mmol/L

**11. ماذا يعني اختبار ( HbA1C) السكر التراكمي؟**

أ. اختبار قياس مستوى جلوكوز الدم لمدة أسبوع.

ب. اختبار قياس مستوى جلوكوز الدم لمدة أسبوعين.

ت. اختبار قياس مستوى جلوكوز الدم لمدة ثلاثة أسابيع

ث. اختبار قياس مستوى جلوكوز الدم لمدة شهرين إلى ثلاثة.

**12. أي من المضاعفات التالية ليس من مضاعفات السكري:**

أ. أمراض الكلى.

ب. أمراض القلب.

ت. الجلطات.

ث. السرطان.

**13. ما الخلايا المنتجة للأنسولين في جسم الانسان؟**

أ. خلايا بيتا بالبنكرياس.

ب. خلايا اللسان.

ت. خلايا الجلد.

ث. نواة الخلية.

**14. أي الاختيارات التالية من أكثر مسببات السكري النوع الثاني:**

أ. التمارين القاسية.

ب. الحمية الغذائية.

ت. السمنة.

ث. ارتفاع درجة الحرارة.

**15. ماذا يعني نقص السكر في الدم؟**

أ. ارتفاع مستوى الجلوكوز بالدم.

ب. قلة مستوى الأنسولين بالدم.

ت. المستوى الطبيعي للسكر بالدم.

ث. مرحلة ما قبل السكري

**16.ما هي علامة انخفاض السكر من علامات التالية:**

أ. الجوع وعدم الوعي.

ب. الصداع والدوار.

ت. التعرق والعصبية.

ث. ازدياد العطش.

**17.ما هي علامة ارتفاع السكر من علامات التالية:**

أ. التبول المتكرر.

ب. النشاط الزائد.

ت. الرغبة في النوم.

ث. الرغبة في الأكل.

**18. ما الاجراء الصحيح من الإجراءات التالية الذي يتخذ عند التعامل مع حالة انخفاض السكر؟**

أ. إعطاء ملعقة شاي سكر.

ب. إعطاء كأس من الماء.

ت. تناول طعام بغير كربوهيدرات.

ث. تناول فواكه.

**19. ما هو مسبب انخفاض السكر من التالي؟**

أ. تناول كثير من الطعام.

ب. شرب المشروبات الغازية.

ت. عمل التمارين.

ث. عدم أخذ جرعة كافية من الانسولين.

**20. ما ذا يعني السكر النوع الثاني؟**

أ. السكر الغير معتمد على الأنسولين

ب. سكر الحمل.

ت. السكر المعتمد على الأنسولين.

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ث. سكر الأطفال.

**21. ما هي وضيفة الأنسولين؟**

أ. تحويل الكربوهيدرات إلى بروتين.

ب. تحويل السكر إلى فيتامينات.

ت. تحويل السكر من الدم إلى خلايا الجسم.

ث. تحويل البروتين إلى معادن.

**22. هل مرض السكر معدي (ينتقل بالعدوى)؟**

أ. نعم

ب. لا

ت. لا أعلم.

**23. متى يستخدم دواء الجلوكاجون؟**

أ. يعالج ارتفاع سكر الدم.

ب. يعالج انخفاض سكر الدم.

ت. يعالج نقصان الأنسولين.

ث. يعالج أمراض القلب.

**24. أي من التالي يعتبر من أعراض السكر الأكثر شيوعاً؟**

أ. مشاكل القدم.

ب. مشاكل اللسان.

ت. مشاكل الأظافر.

ث. مشاكل الشعر.