

Training of teachers in the management of children's diabetes at school: A rapid review

S. Elias

 **orcid.org/0000-0002-2926-5016**

Mini dissertation submitted in partial fulfilment of the degree *Master of Arts* in Counselling Psychology at the North-West University

Supervisor: Prof E van Rensburg

Co-supervisor: Prof E Deacon

Submission date: 18 December 2020

Table of Contents

ACKNOWLEDGEMENTS	i
SUMMARY	ii
PERMISSION TO SUBMIT.....	iv
DECLARATION BY RESEARCHER.....	v
PREFACE.....	vi
PROOF OF LANGUAGE EDITING.....	vii
Section 1: Introduction, Literature Review, and Overview of Study.....	1
1.1 Introduction	1
1.2 Diabetes Mellitus	1
1.2.1 Type 1 Diabetes	2
1.2.2 Type 2 Diabetes	3
1.3 Consequences of Diabetes.....	5
1.3.1 Acute Complications of Diabetes	5
1.3.1.1 Hypoglycaemia.....	5
1.3.1.2 Diabetic Ketoacidosis.....	6
1.3.1.3 Associated Autoimmune Diseases	7
1.3.2 Long-Term Complications.....	7
1.3.3 Other Complications Associated With Diabetes	8
1.3.4 Psychological Challenges Associated With Diabetes.....	9
1.3.4.1 Psychological Disorders and Adjustment.....	9
1.3.4.2 Family Functioning and Social Support.....	9
1.3.4.3 Stress and Coping.....	10

1.3.4.4	Quality of Life	11
1.3.5	Consequences for the Child in the School Context	11
1.4	Diabetes Management.....	13
1.4.1	Diabetes Treatment.....	13
1.4.2	Blood Glucose Monitoring	14
1.4.3	Insulin Therapy Treatment	14
1.4.4	Nutrition.....	15
1.4.5	Exercise.....	15
1.4.6	Psychological Care	16
1.4.7	Education	17
1.4.7.1	Role of Teachers and School Staff in Diabetes Management	17
1.4.7.2	Training of Teachers	19
1.5	Conclusion	22
1.6	Contextualisation of This Study.....	23
1.7	Research Question.....	24
1.8	Aim.....	24
1.9	Research Methodology and Design	24
1.9.1	Research Design	24
1.9.2	Process of Analysis of Literature.....	25
1.9.2.1	Stage 1: Search Strategy.....	25
1.9.2.2	Stage 2: Critical Appraisal of Articles Using Titles, Abstracts and the Inclusion and Exclusion Criteria.....	26
1.9.2.3	Stage 3: Critical Appraisal of the Quality of the Selected Articles.....	26

1.9.2.4	Stage 4: Data Extraction.....	28
1.9.2.5	Stage 5: Data Analysis	28
1.10	Ethical Considerations	29
1.11	Outline of the Study	30
1.12	References	32
Section 2: Manuscript for Submission		42
2.1	Guidelines for Submission: South African Journal of Education	42
2.1.1	Editorial Policy	42
2.1.2	Preparation and Structure of Manuscripts	44
2.1.3	References.....	45
2.1.4	Submission of Manuscripts.....	47
2.2	Manuscript: Training of teachers in the management of children’s diabetes at school: A rapid review.....	47
Section 3: Critical Self-Reflection.....		71
3.1	Introduction	71
3.2	Conception of the Study.....	71
3.3	Research Aim	72
3.4	Epilogue	72
3.4.1	Research Process	72
3.4.2	Findings	73
3.4.3	Limitations.....	74
3.4.4	Recommendations.....	74
3.4.5	Significance of the Study.....	75

3.5	Personal Reflection of the Researcher	75
3.6	References	78
	Complete References	80
	ADDENDUM A.....	96

ACKNOWLEDGEMENTS

I would like to make special mention of the following people without whom this dissertation would not have been possible.

- Firstly, all praise to my **Creator** for blessing me with this opportunity and keeping me steadfast in my journey to achieve my goals.
- To my research supervisor **Prof Esmé**, your support, encouragement and guidance were priceless in this undertaking. I am grateful for you allowing me to be autonomous while remaining dedicated and patient through my struggles in this unique year. Your wisdom and experience increased my skills and curiosity as a researcher. Your efforts as a committed supervisor even on holiday have not gone unnoticed.
- To **Prof Deacon**, thank you for your invaluable input in adding the final touches to this study.
- My dear **family and friends**, I am eternally grateful for your consistency in not only motivating me but for providing a shoulder to lean on through tough times. It is only because of your unwavering support that I was able to push through.
- To **Emilia**, my right hand, thank you for easing my responsibilities so that I may pursue my passion.
- Finally, to my **husband and children**, thank you for walking this journey with me and sacrificing your comforts and friends to allow me to reach my dreams. Your faith in me was like a breath of fresh air; it constantly spurred me on to finish this dissertation and make you proud. My desire to be a psychologist and a better person is only because of you. I thank you from the bottom of my heart and dedicate this dissertation to you all.

SUMMARY

Training of teachers in the management of children's diabetes at school: A rapid review

Keywords: children, diabetes mellitus, rapid review, teachers, Type 1 diabetes

Diabetes mellitus is a chronic disease that is increasing at an alarming rate in school-aged children. Due to the elaborate insulin regimen and day-to-day management and care of this disease, school-going children will require assistance with carrying out diabetes management tasks at school. Children require regular glucose testing, assistance with day-to-day management and monitoring of diabetes emergencies such as hyper- and hypoglycaemia. It is therefore imperative that schoolteachers are trained to know about diabetes care and management, and the handling of diabetes emergencies should these arise at school. The unsuccessful management of diabetes may lead to short-term and long-term complications. The inability to deal with diabetic emergencies is life-threatening and can even be fatal. Literature has thus far focussed on the perception of teachers, children, and parents on teachers' knowledge and ability to assist with the management of diabetes at school and the training of school nurses. However, there is very limited research on the training programmes available to equip teachers to manage diabetes successfully in school.

This rapid review study aimed to collate and synthesise existing scientific literature on the training programmes available to educate teachers regarding diabetes and its management in the school setting.

Scientific literature was identified using a pre-selected keyword search from the Ebsco Discovery Services (EDS) databases. A total number of 269 possible articles were identified, and

after a rigorous, critical appraisal process, 11 articles were selected that matched the inclusion and exclusion criteria for this rapid review study. The extracted data were analysed using a thematic synthesis approach. Six main themes were derived from this process, namely training methods, the efficacy of programmes, diabetes knowledge, teachers' confidence, cost-effective methods, and content of the training programmes. It was found that online training and face to face training were efficacious and improved diabetes knowledge and teachers' confidence to manage diabetes in the school context. Moreover, it was noted that interactive education training programmes yielded the best results. It seemed most programmes concentrated on the theory regarding diabetes pathology and a practical demonstration of insulin regimens.

It was recommended that further research be undertaken regarding diabetes programmes specifically for teachers and comparative studies between different training methods to ascertain the most effective approach. Further research must include larger sample sizes, more schools, and longer follow-up studies. There is also a need for additional research in more African countries to allow equal opportunity in schools for all children. The rapid review study was able to provide guidelines for the development of a training programme that could be implemented in South African schools. The review is one of the first of its kind that focusses on training programmes specifically for teachers and thus contributes to the body of evidence that serves to inform the development of a customised training programme that could prove effective in South Africa's distinctive school environment.

PERMISSION TO SUBMIT

We, the undersigned and supervisors of this study and co-authors of the journal manuscript, hereby declare that the mini-dissertation entitled *Training of teachers in the management of children's diabetes at school: A rapid review* completed by Sameeha Elias, does reflect the research regarding the subject matter and is her own work. Permission is granted that she may submit the manuscript for examination purposes and confirm that the mini-dissertation submitted is in partial fulfilment of the requirements for the degree Master of Arts in Counselling Psychology at the Potchefstroom Campus of the North-West University. The article may also be submitted to the *South African Journal of Education* for publication purposes.



Prof E van Rensburg

Supervisor



Prof E Deacon

Co-supervisor

DECLARATION BY RESEARCHER

I, Sameeha Elias, hereby declare that this manuscript, titled, *Training of teachers in the management of children's diabetes at school: A rapid review*, is my own work and has not previously been submitted for examination. I declare that all sources of information utilised in this rapid review have been referenced. Language editing of this research has been conducted in line with stipulated requirements of the North-West University. Furthermore, I declare that this manuscript was submitted to the Turnitin software system, and a satisfactory report was received regarding plagiarism.

A handwritten signature in black ink, appearing to read 'SE Elias', is written over a horizontal line.

Sameeha Elias

Student number:30708346

PREFACE

This mini-dissertation has been structured in article format according to the requirements stipulated within the North-West University Manual for Master and Doctoral Studies. The manuscript consists of three sections. Section 1 provides an in-depth overview of the literature about the research topic. The article entitled Training of teachers in the management of children's diabetes at school: A rapid review is presented in Section 2 and is written following the requirements of the *South African Journal of Education*. Lastly, a critical reflection of the research process is included in Section 3. Section 1 and 3 were written following the APA 7th edition guidelines, and Section 2 is based on the specific guidelines set out by the *South African Journal of Education*.

PROOF OF LANGUAGE EDITING

Dr Althéa Kotze

Independent, qualified language practitioner

Language editing (English & Afrikaans) Translation
(English–Afrikaans–English)

althea.erasmus@gmail.com

4 Ixia Close

Yzerfontein

7351

South Africa

To whom it may concern

This document confirms that the dissertation listed below was edited for appropriate English language use, spelling, grammar, punctuation, and style by Dr Althéa Kotze.

MANUSCRIPT TITLE: Training of teachers in the management of children's diabetes at school: A rapid review

STUDENT: S. Elias

STUDENT NUMBER: 30708346

Dr Althéa Kotze

DATE ISSUED: 01 12 2020

Althéa Kotze • Accredited language practitioner • APed (South African Translators' Institute, no 1001073)

• PhD Afrikaans and Dutch • MA Afrikaans and Dutch • MA Applied Linguistics • BA Hons • BA • PGCE •

4 Ixia Close • Yzerfontein • 7351 • South Africa • +27 (0) 823518509 (m) •

Section 1: Introduction, Literature Review, and Overview of Study

1.1 Introduction

This study aims to explore the training programmes that are available to equip teachers in the management of children's diabetes at school. The first section will introduce and discuss the key concepts related to the study. The literature review will focus on diabetes and its prevalence in children and adolescence, the different types of diabetes and their complications, the consequences and management of diabetes, the role of the teachers and the training of teachers to manage diabetes at school. The last section will focus on the critical reflection and process of the study and the experiences of the researcher.

1.2 Diabetes Mellitus

Diabetes mellitus can be classified as a group of metabolic diseases characterised by hyperglycaemia caused by deficiencies in insulin secretion, insulin action, or both (American Diabetes Association (ADA), 2013; Kharroubi & Darwish, 2015; Punthakee et al., 2018). Furthermore, it can be understood as a multifaceted metabolic disorder in which the body's response to the hormone insulin is impaired (Craig et al., 2014). Diabetes develops because of numerous pathogenic processes, including autoimmune destruction of the β -cells of the pancreas resulting in insulin deficiency and abnormalities with consequent resistance to insulin action (ADA, 2013). The onset and course of diabetes is determined by pathological insulin functioning and deficient secretion (Craig et al., 2014). Impairment of insulin secretion or defect insulin action can both occur simultaneously in a patient, and it can thus be difficult to ascertain which abnormality is the primary cause for hyperglycaemia (ADA, 2013). Chronic hyperglycaemia is

related to dysfunction, long- term damage and failure of different organs such as the heart, kidneys, nerves, and eyes (ADA, 2013). Diabetes is a chronic disease that is increasing at a rapid rate worldwide. The three main forms of diabetes are type 1 diabetes, type 2 diabetes and Gestational diabetes – the latter occurs during pregnancy and has complications for both mother and child as reported by the International Diabetes Federation (IDF), 2019. The focus of this study will include both type 1 and type 2 diabetes as both these types of diseases affect children and require a multilevel approach for successful management.

1.2.1 Type 1 Diabetes

Type 1 diabetes is recognised globally as one of the most common chronic childhood diseases which results from the destruction of the β -cells of the pancreas. The rate of β -cell destruction varies amongst individuals, and it can be rapid in some individuals, mainly infants and children and slow in others, mainly adults (ADA, 2013; IDF, 2019). The autoimmune destruction of the β -cells is linked to genetic predispositions and environmental factors which are still poorly defined (ADA, 2013; IDF, 2019). Craig et al. (2014) further reiterate that although the aetiology of type 1 diabetes is multifactorial, the specific roles of environmental factors, genetic susceptibilities, the immune system, and the β -cells of the pancreas remain unclear. Patterson et al. (2014) concur that while there is clear evidence of genetic predisposition for β -cell destruction, there is only circumstantial evidence of the role of environmental factors leading to the destruction of the β -cells and ultimately absolute dependence on insulin. Most patients with this type suffer from insulin deficiency and episodic ketoacidosis (Kharroubi & Darwish, 2015). The diagnosis of type 1 diabetes is made from observing typical symptoms such as polydipsia, polyuria, weight loss and blood sugar measurement (Kharroubi & Darwish, 2015; Ziegler & Neu, 2018). Symptoms may include shortness of breath, abdominal pain, and vomiting (Ziegler

& Neu, 2018). The patient must receive medical assistance immediately to prevent hyperglycaemia and ketoacidosis. Some patients, predominantly children and adolescents, may present with ketoacidosis as the first indicator of the disease (ADA, 2013). This form of diabetes hinders insulin production in the pancreas, therefore making it difficult for the body to use glucose and adequately break down food, resulting in an increase of unabsorbed glucose in the body. Therefore, people with type 1 diabetes must inject insulin into their bodies and successfully manage their diets (Lasecki et al., 2008). It must be noted that a small percentage of people have idiopathic diabetes (ADA, 2013), a rare form of type 1 diabetes of unknown origin that is not due to autoimmunity.

It is estimated that globally around 98,200 children and adolescents under the age of 15 years are diagnosed with type 1 diabetes annually, and this estimated number increases to 128,900 when the age range extends to under 20 years. In total, 1,110,100 children and adolescents younger than 20 years are estimated to have type 1 diabetes globally (IDF, 2019). Accurate figures about the prevalence of diabetes in Africa are not available due to the scarcity of information. However, according to the data extrapolated from a few African countries in 2019, it was ascertained that 25,800 children under the age of 19 years are living with type 1 diabetes and 10,300 children in the same age group have been newly diagnosed with the disease (IDF, 2019). This rising number has a significant impact on the social and economic burden of a country (IDF, 2019).

1.2.2 Type 2 Diabetes

Type 2 diabetes, a disease that used to be common in older adults, is now increasing in children at a rapid rate and becoming a major public health concern worldwide (Craig et al., 2014; Pansier & Schulz, 2015; IDF, 2019). This increase may be due to genetics, poor diet,

childhood obesity and the alarming decline of physical activity levels (Pansier & Schulz, 2015).

The diagnosis of type 2 diabetes in paediatric patients is very difficult as most patients are asymptomatic and have atypical representations (Erhardt & Molnár, 2004). According to the ADA (2013), there are many different causes for this type of diabetes, but the specific aetiologies are not known. However, it is clear that autoimmune destruction of β -cells or other causes as in type 1 diabetes does not occur in type 2 diabetes. Most young people with type 2 diabetes are obese, and this obesity itself leads to insulin dependence (ADA, 2013).

Furthermore Craig et al. (2014), state that a clinical diagnosis can also be hampered by the presence of ketoacidosis in young patients diagnosed with type 2 diabetes and the prevalence of overweight in young people with type 1 diabetes, thus making it difficult to distinguish the two. Patients with type 2 diabetes are at increased risk of developing macrovascular and microvascular complications including cardiovascular disease, end-stage renal disease, loss of visual acuity, and limb amputations (ADA, 2013; Reinehr, 2013). Therefore, children with type 2 diabetes need to exercise regularly and monitor their food intake. Reinehr (2013), further emphasises that diet and exercise are the cornerstones of treatment for type 2 diabetes in children and adolescents. However, they are seldom successful in isolation, as they require great motivation and lifestyle changes.

Due to the increase in physical inactivity and obesity levels among children and adolescents in many countries type 2 diabetes in this age range has the potential to lead to serious adverse health outcomes (IDF, 2019). More than 5000 American youth aged ten to nineteen are diagnosed with type 2 diabetes every year (Centre for Disease Control (CDC), 2017); however, it remains rare in this age group in Central Europe. Even though reliable data are sparse, there is

evidence that type 2 diabetes is increasing among children and adolescents in countries such as the United Kingdom, United States of America, India, and Africa (IDF, 2019).

1.3 Consequences of Diabetes

Diabetes results in different health implications; these consist of acute, long-term, and other complications.

1.3.1 Acute Complications of Diabetes

Complications such as hypoglycaemia, diabetic ketoacidosis, and autoimmune diseases may occur if diabetes is not managed correctly.

1.3.1.1 Hypoglycaemia

Hypoglycaemia is one of the key factors in diabetes care, resulting in common and serious complications in diabetes (Abraham et al., 2018; Bratina et al., 2018; IDF, 2019). It is characterised by unusually low blood sugar levels and affects those people that are on insulin treatment (IDF, 2019; Kalra et al., 2013). Hypoglycaemia is caused by too much insulin in the body, missed or delayed snacks or meals, low intake of carbohydrates and unplanned exercise and activities (IDF, 2019). The symptoms are unique to everyone, with some patients being asymptomatic (Ziegler & Neu, 2018). Typical symptoms may include anxiety, blurred vision, hunger, irritability, shakiness, headache, dizziness, and fatigue (IDF, 2019). In young children, behavioural changes, for example, agitation, quietness, irritability, and tantrums may be prominent (Abraham et al., 2018). Hypoglycaemia should be managed by prevention as it is often predictable due to its symptomology (Abraham et al., 2018; Kalra et al., 2013).

Diabetes education regarding hypoglycaemia is critical to its prevention (Abraham et al., 2018; Bratina et al., 2018). The patient, parents, caregivers, and school teachers should be adequately trained to recognise the early warning signs of hypoglycaemia and to treat low levels of blood sugar timeously and effectively (Abraham et al., 2018). Severe hypoglycaemia requires urgent medical treatment and intramuscular glucagon administration is the optimum treatment (Bratina et al., 2018). Hypoglycaemia may result in loss of consciousness, heart attacks, seizures, and in rare cases, death (Bratina et al., 2018; Kalra et al., 2013). If untreated, hypoglycaemia in school-aged children can result in poor cognitive function, negative psychosocial consequences, undesirable compensatory behaviours, and harmful physiological reactions (Abraham et al., 2018; Bratina et al., 2018).

1.3.1.2 Diabetic Ketoacidosis

Diabetic ketoacidosis occurs when there is not enough insulin to allow for sufficient glucose to enter the cells (Raghupathy, 2015; Sherry & Levitsky, 2008; Wolfsdorf et al., 2018). Symptoms of diabetic ketoacidosis include vomiting, dehydration, problems with breathing, confusion, drowsiness, and eventual loss of consciousness or coma (Raghupathy, 2015; Sherry & Levitsky, 2008; Wolfsdorf et al., 2018). This complication affects children with type 1 diabetes more than those with type 2 diabetes. It is common in young infants who have not been diagnosed correctly as well as ethnic minority groups in low socio-economic environments that have limited access to medical health care facilities (Wolfsdorf et al., 2018). Diabetic ketoacidosis is a serious medical emergency, and if untreated can lead to death. Treatment includes administering intravenous fluids to alleviate dehydration and rectify salt levels and intravenous insulin to suppress ketone bodies manufactured by the body (Raghupathy, 2015; Sherry & Levitsky, 2008; Wolfsdorf et al., 2018).

1.3.1.3 Associated Autoimmune Diseases

Children who have type 1 diabetes are at a greater risk of developing comorbid autoimmune diseases than children in the general population (Mahmud et al., 2018). The comorbidities occur with greater prevalence in females as compared to males and increases with age (Mahmud et al., 2018). The most common autoimmune comorbid disease seen in patients with type 1 diabetes includes thyroidism (Mahmudi et al., 2018; Ziegler & Neu, 2018). Hypothyroidism (a thyroid that is underactive and does not produce enough thyroid hormone) occurs more frequently than hyperthyroidism (an overactive thyroid that produces too much thyroid hormone) in children and adults (Mahmudi et al., 2018). The second most common autoimmune condition associated with type 1 diabetes is celiac disease (autoimmune disease affecting the small intestine). The risk of celiac disease is inversely related to the age of diagnosis of diabetes with the greatest risk occurring in those diagnosed before five years of age (Mahmudi et al., 2018). Other autoimmune comorbid diseases that are frequently diagnosed with type 1 diabetes are primary adrenal insufficiency, collagen vascular disease, other gastrointestinal diseases, and skin diseases (Mahmudi et al., 2018).

1.3.2 Long-Term Complications

Diabetes complications result due to insufficient management of the disease over a prolonged period. Regular monitoring for the presence of these complications may result in early identification and effective treatment, thereby halting or delaying the onset of the physical disabilities associated with these complications (Kaufman et al., 2009). Retinopathy is one of the most common complications associated with diabetes. It is an eye disease that usually occurs after the onset of puberty and after five to ten years of having diabetes (Kaufman et al., 2009). However, it has also been reported in prepubertal children and in people who have had diabetes

for one or two years (Kaufman et al., 2009). Nephropathy is a kidney disease associated with diabetes. Optimal blood glucose levels and blood pressure management is essential to delay or manage this complication (Kaufman et al., 2009). Regular screening is necessary to reduce the risk and or slow the progression of nephropathy (Kaufman et al., 2009). Diabetes also affects nerve functioning and may result in loss of sensation in the feet. The risk of foot complications is increased for people who had diabetes for over ten years. Regular foot examinations for children and adolescents are painless and inexpensive and not only provide screening but education about foot care too (Kaufman et al., 2009).

1.3.3 Other Complications Associated With Diabetes

The normal physical development of children and adolescents is monitored by regular measurements of their weight, height, and sexual development (Ziegler & Neu, 2018). The diagnosis of diabetes may have an impact on normal development in children and adolescents. It may result in excessive weight gain during and after puberty, particularly in girls who have been diagnosed during puberty (Mahmud et al., 2018). The weight gain may be because of excessive exogenous insulin or intensive insulin therapy. Obese patients are at a greater risk of cardiovascular complications and therefore, weight gain should be carefully monitored and managed during diabetes care (Mahmud et al., 2018). This can also lead later to eating disorders and mental health issues.

Menarche may also be delayed in children who have been diagnosed with diabetes before the onset of puberty. Delayed menarche is associated with other diabetes complications such as retinopathy and nephropathy, whereas early menarche is not (Mahmud et al., 2018).

1.3.4 Psychological Challenges Associated With Diabetes

A diabetes diagnosis does not only result in health implications but also in psychological challenges in adapting to the new way of life.

1.3.4.1 Psychological Disorders and Adjustment

There is a greater incidence of depression, anxiety, stress-related mental disorders and eating disorders in children with diabetes when compared to their metabolically healthy counterparts (Delamater et al., 2018; Ziegler & Neu, 2018). Many children and adolescents display psychiatric problems such as adjustment disorders during the initial period after diagnosis (Pérez-Marín et al., 2015; Ziegler & Neu, 2018). Symptoms usually displayed include anxiety and depression, difficulty in building their identity, a decline in self-care, and an impaired metabolic control (Pérez-Marín et al., 2015). Most get over it within a year; however, if adjustment problems exist, children are at higher risk for continued adjustment difficulties (Delamater et al., 2018, Ziegler & Neu, 2018). Additionally, those children with poor metabolic control are more prone to having underlying psychosocial problems or psychiatric disorders than those who have good metabolic control (Delamater et al., 2018).

1.3.4.2 Family Functioning and Social Support

Children and adolescents with diabetes require social support from parents and other family members. Diffusion of responsibilities, family conflict and over or under involvement in diabetes management relative to the child's developmental stage has been associated with poor regimen adherence and glycaemic control (Delamater et al., 2018; Helgeson et al., 2019). Family conflict and negative affect regarding blood glucose monitoring have also been linked to depression (Delamater et al., 2018). Peer relationships are important during childhood and adolescence. Social support from friends can complement parent relationships and positively influence

diabetes management outcomes (Delamater et al., 2018; Helgeson et al., 2019). Self-care tasks require planning and carrying them out may make children feel "different" from their classmates and friends (Kaufman et al., 2009). Fear of being stigmatised appears to be an obstacle in acquiring support from friends (Delamater et al., 2018). Furthermore, when children attribute negative peer reactions to their self-management, they are more likely to have increased diabetes stress and problems with adherence to diabetes care plans (Delamater et al., 2018). Friend relationships with more conflict are associated with poor diabetes outcomes (Helgeson et al., 2019).

1.3.4.3 Stress and Coping

Young people with diabetes may be exposed to unique day-to-day challenges. Learning to cope with these challenges can be particularly difficult for young children and adolescents and may lead to emotional and behavioural problems (Kaufman et al., 2009). They usually face stressors related to friends and siblings, and their coping behaviours include taking personal responsibility or choosing an alternative activity (Delamater et al., 2018). Stress associated with diabetes may have a direct or indirect effect on the life of children and adolescents. Studies using a direct approach have shown that children with high life stress have poor glycaemic control and research using an indirect approach, found a harmful effect of diabetes stress on diabetes self-management (Delamater et al., 2018). According to Delamater et al. (2018), research indicates that children with poor glycaemic control use learned helplessness, avoidance coping style, and wishful thinking in response to stress. Maladaptive coping in young people has been associated with poor adherence to regimens and other diabetes outcomes, including depressive symptoms, diabetes management, and quality of life (Delamater et al., 2018).

1.3.4.4 Quality of Life

Quality of life forms a key outcome in diabetes care. Lower quality of life seems to be related to psychiatric disorders, particularly anxiety and depression and adverse family environment, especially disagreements about diabetes (Delamater et al., 2018). Young people's perception of diabetes as upsetting, difficult to manage, stressful as well as fearing hypoglycaemia is associated with a less favourable quality of life (Delamater et al., 2018). Psychological distress, conflictual family environment, conflictual peer relations, and risky personality traits are linked to poor self-care behaviour and glycaemic control which in turn affects the quality of life in youth with diabetes (Helgeson et al., 2019).

1.3.5 Consequences for the Child in the School Context

The number of children and adolescents with diabetes attending school is increasing, placing a considerable burden on families, schools, and health care systems. School years are a time of learning, having fun, making friends, and joining peer groups. However, for children with diabetes, this can instead be a time when they are isolated or excluded or stigmatised (Bratina et al., 2018). Young people with diabetes have an increased risk of being subjected to discrimination in the school context that may impact on self-esteem, causing feelings of stigmatisation (Bratina et al., 2018).

The children will require encouragement, support, and supervision with diabetes self-management throughout their school years as they spend a considerable amount of their day at school (Bratina et al., 2018). Optimal management of diabetes is a pre-requisite for the avoidance of diabetic-related complications. If the child is not assisted or supervised in the administration of insulin or regular blood glucose monitoring at school, it could lead to dire consequences. It could contribute to poor glycaemic control and lead to complications such as

hyperglycaemia and hypoglycaemia (Bratina et al., 2018, Marks et al., 2013). Young children rely on regular blood glucose testing to detect hypoglycaemia as they may not recognise the signs themselves or be unable to ask for assistance due to their lack of verbal or developmental skills (Marks et al., 2013). Hyperglycaemia or high level of blood glucose should be prevented at all costs as it not only increases the risks of vascular complications over time but also reduces the child's ability to concentrate and may harm academic performance. Chronic hyperglycaemia can cause a decline in cognitive function and, particularly in children, may affect brain structure and function (Bratina et al., 2018).

Hypoglycaemia or low blood glucose is the most common acute complication of type 1 diabetes (Bratina et al., 2018; Ziegler & Neu, 2018). Fear of severe hypoglycaemia can be a burden for the child and their caregivers, causing significant anxiety and stress, thereby limiting the quality of life, and preventing the child from performing some routine daily activities. Severe hypoglycaemia can have adverse psychosocial consequences and can promote negative compensatory behaviours (Bratina et al., 2018). Severe hypoglycaemic episodes may lead to injury, hospitalisation and in rare cases, death. School personnel must be appropriately instructed to deal with a hypoglycaemic episode (Bratina et al., 2018; Ziegler & Neu, 2018).

According to Marks et al. (2013), research states that most school-going children with diabetes are either missing class or break-time with their friends to engage in diabetes treatment. Children are also frequently absent from class due to diabetes issues that cannot be managed in school. Poor attendance may impact on academic performance and being away from peers during the break may affect psychosocial development (Marks et al., 2013).

Stressful situations at school, such as assessments and exams, are associated with an increased risk of a transient episode of hypoglycaemia or hyperglycaemia. Both these episodes are related

to transient cognitive impairment (Bratina et al., 2018). Acute hyperglycaemia has been linked to reduced motor cognitive performance and effects on mood and co-ordination. Mild hyperglycaemia or hypoglycaemia may also lead to an inability to focus, fatigue, distraction, decreased memory, and mood variability all of which can affect learning capacity and overall behaviour (Bratina et al., 2018).

The risk of hypoglycaemia is a significant barrier to physical activity, and the child's nutrition should be adjusted according to the type and intensity of the exercise. Children who are on a twice-daily regimen (injecting insulin at two different times of the day) should be required to have a snack and a meal during the day to prevent hypoglycaemia (Marks et al., 2013). These unique challenges faced by children with diabetes may contribute to them being discriminated against and stigmatised, affecting their psychological well-being.

1.4 Diabetes Management

1.4.1 Diabetes Treatment

Diabetes is one of the most common endocrine diseases in children and adolescents and requires specialised diabetological treatment from a multiprofessional team and continuing care (Reinehr, 2013). The multiprofessional team may include parents, families, teachers, paediatricians' endocrinologists, psychologists, social workers, and psychiatrists (Delamater et al., 2018; Phelan et al., 2018; Reinehr, 2013; Ziegler & Neu, 2018).

The ISPAD guidelines 2018 state that the international gold standard for diabetes treatment in children, adolescents and young adults is intensive management, especially glycaemic control.

The different insulin analogues now have advanced technologically, including pumps, sensors, and automated insulin delivery systems in certain countries (Wolfsdorf et al., 2018).

1.4.2 Blood Glucose Monitoring

Regular glucose self-monitoring using accurate fingerstick or continuous glucose monitoring (CGM) is essential for successful diabetes management in children and adolescents (DiMeglio et al., 2018). Children and adolescents may require to test their blood sugar on average between six to ten times per day or much higher in some cases (DiMeglio et al., 2018; Ziegler & Neu, 2018). To achieve daily glucose targets regular review of the results to identify trends and adjust the diabetes management plan may be required (DiMeglio et al., 2018). It is important to measure blood glucose before meals and when engaging in exercise to confirm and prevent hyperglycaemia (DiMeglio et al., 2018).

1.4.3 Insulin Therapy Treatment

The main aim of insulin therapy in all age groups is to achieve as close to physiological insulin replacement as possible and optimal glycaemic control using the locally available prandial and basal insulins (Danne et al., 2018). Insulin pump therapy is often used in preschool children while injections using a syringe, or an insulin pen is used amongst all age groups (Ziegler & Neu, 2018). Administering the insulin injections within the same area, checking of injection sites, monitoring injection techniques and skills remain the responsibility of the parents, caregivers, including teachers and health care professionals (Danne et al., 2018).

Treatment should be individualised to each patient and must be based on in-depth education appropriate for the maturity, age, and individual needs of the child and family (Danne et al., 2018). Besides, Danne et al. (2018), suggest that healthcare providers need to advise children, adolescents, their parents, care providers, and teachers on adjusting insulin therapy safely and

efficiently. As the individual's needs are ever-changing, this training requires regular evaluation, re-examination, and reinforcement (Danne et al., 2018).

1.4.4 Nutrition

Nutritional management is one of the most vital aspects of diabetes care and education (Smart et al., 2018). Correct eating can further improve metabolic and clinical outcomes when used in conjunction with other elements of diabetes care. Healthy nutritional lifestyles should be recommended for all children and adolescents with diabetes and tailored to the cultural, ethnic, cognitive, and psychosocial circumstances of the child and family (Smart et al., 2018).

Knowledge of the effect of one's carbohydrate intake on the blood sugar level forms the basis for calculating the suitable prandial dose of insulin (Smart et al., 2018; Ziegler & Neu, 2018). As a result of this, the flexibility of carbohydrate intake at mealtimes can be increased, as well as improving glycaemic control and quality of life (Smart et al., 2018). Dietary recommendations should be based on healthy eating principles for the child with diabetes but also for the entire family (Smart et al., 2018). Nutritional education and lifestyle counselling must be delivered to both the individual child and the family.

1.4.5 Exercise

Adolfsson et al. (2018), emphasise that exercise plans and management recommendations should be individualised following children's safety, experience, and goals in mind. The individualised plan should include discussions about when it is the safest to exercise, the percentage reduction of insulin before exercise, and the amount and type of carbohydrate necessary for specific exercise (Adolfsson et al., 2018; Lorenzi & Trenney, 2015). The benefit of using specific insulin regimens such as multiple daily injections or pump therapy combined with exercise should be communicated to the patients and families. For successful blood glucose

management, patients should be encouraged to record their physical activity, food, glucose levels, and insulin daily. Exercise and sports guidance should be included in the management plans at school for teachers and carers (Adolfsson et al., 2018; Lorenzi & Trenney, 2015). Regular exercise not only aids in the management of diabetes but helps reduce the risk for developing secondary diabetes complications (Lorenzi & Trenney, 2015). Physical activity at school improves the students' physical health and well-being and keeps them fit. Children who are fit and healthy are more ready to learn, less likely to be absent, and have better academic performance (Peppas et al., 2011).

1.4.6 Psychological Care

Delamater et al. (2018), state that there is a greater prevalence of depression, anxiety, stress-related mental disorders and eating disorders among young people with diabetes compared to their counterparts. Incidentally, those children with poor metabolic control are more prone to having underlying psychosocial problems or psychiatric disorders than those who have good metabolic control (Delamater et al., 2018). It is vital to implement effective psychological interventions that consider the psychosocial factors that affect patients during diabetes (Pérez-Marín et al., 2015). Some of these factors include adjusting to the diagnosis, stressful life events, emotional disturbances and family conflict and breakdown (Pérez-Marín et al., 2015). Therefore, the multiprofessional diabetes management team should include psychologists, social workers, and psychiatrists (Delamater et al., 2018). It is therefore imperative that these children be referred for a comprehensive psycho-educational, neuropsychological evaluation and routine assessments of physical, emotional, intellectual, and social functioning to monitor progress in all domains of functioning (Delamater et al., 2018).

1.4.7 Education

Diabetes education forms a fundamental part of the multi-modal diabetes treatment and is the key to the successful management of diabetes (IDF, 2019; Ziegler & Neu, 2018). Education should not be offered exclusively to the patient and his family but to other key persons caring for the young patients, including day-care centres, kindergartens, schools, and residential facilities (Ziegler & Neu, 2018). Teachers and other school staff should be trained adequately by health care professionals in the administration or careful supervision of the administration of insulin to manage high or low blood glucose levels, to be aware of the signs and symptoms of hypoglycaemia, to identify psychological problems, and refer children for appropriate treatment (Abraham et al., 2018; Bratina et al., 2018; Edwards et al., 2014; Lorenzi & Trenney, 2015; Peppia et al., 2011). For successful management of the disease a collaborative approach between parents, the child's health care team and the school are mandatory (ADA, 2013; Phelan et al., 2018; San Laureano et al., 2018).

1.4.7.1 Role of Teachers and School Staff in Diabetes Management

Teachers and schools are thus placed in a vital position to assist with diabetes care and management. The number of children with diabetes attending primary school is on the increase (Bobo et al., 2011; Edwards et al., 2014; Kaufman et al., 2009; Marks et al., 2013; Ziegler & Neu, 2018). Children spend approximately 6 to 10 hours a day at school or engaging in after school activities (Ješić et al., 2016; Pansier & Schulz, 2015; Tolbert, 2009) and therefore require support to manage their diabetes at school. This entails intensive resources, blood glucose monitoring, insulin administration, treatment of hypoglycaemia (Kaufman et al., 2009; Pansier & Schulz, 2015), as well as following a correct meal plan (Ješić et al., 2016; Kaufman et al., 2009; Siminiero et al., 2000). Young children are generally assisted in the administration and

monitoring of insulin by their parents due to their immature developmental stage and the difficulty of the tasks required (Edwards et al., 2014; Marks et al., 2013). They may experience challenges in administering or monitoring insulin at school when they are away from their parents (Edwards et al., 2014; Kaufman et al., 2009; Marks et al., 2013).

Teachers will, therefore have to fulfil the role of caregiver, assisting with diabetes management and providing emotional support in addition to being the educator at school (Boden et al., 2012). Teachers may be required to assist with insulin injections or insulin pump therapy, as well as testing and monitoring glucose levels throughout the day and searching for any hypoglycaemic or hyperglycaemic reactions during school hours (Edwards et al., 2014; Marks et al., 2013). The need for assistance will vary across different age groups (Pansier & Schulz, 2015). Teachers will be required to assist students with maintaining optimal glycaemic levels at school by adjusting and individualising treatment for specific school activities such as sports and exams (Bratina et al., 2018; Edwards et al., 2014). Special attention should be paid to testing glucose levels before each meal, before and after physical activity and before a test or an exam (DiMeglio et al., 2018). The effect of high or low blood glucose levels on exam performance should be taken into consideration by the teachers (Bratina et al., 2018).

Children with diabetes have specific nutritional needs that differ with other children their age and teachers may be required to make allowances for regular snacks even during class time. Teachers may supervise the children's carbohydrate intake and adjust meal frequency according to the number of insulin doses required by the child's daily treatment regimen (Bratina et al., 2018; Ziegler & Neu., 2018).

Teachers should ensure that all students with diabetes be given the same opportunities as their peers and make certain they can participate safely in all physical and sporting activities (Bratina

et al., 2018). Teachers need to be mindful of emergencies which may occur during hypoglycaemia and its relationship to physical exercise and academic performance (Abraham et al., 2018; Bratina et al., 2018).

Schools provide an inimitable opportunity to identify and treat psychological problems in young people with diabetes and close collaboration between school personnel, and health care professionals are recommended (Bratina et al., 2018; Delamater et al., 2018). School personnel can serve as a bridge to community mental health workers by providing psychosocial screenings and identifying early warning signs of emerging psychological problems and thereby enabling appropriate referrals to timeously address the mental health needs of children with diabetes (Bratina et al., 2018; Delamater et al., 2018). Teachers may also play an important role in providing social and emotional support to children who have challenges with coping with stress, bullying and stigmatisation associated with diabetes at school.

The scientifically proven long-term health benefits of successful diabetes management indicate that the best efforts for diabetes control should be carried out at school as well as at home (Ješić et al., 2016). Children may because of poor management be at risk of other diabetes complications, affecting their physical, psychological, and social well-being (Pansier & Schulz, 2015).

1.4.7.2 Training of Teachers

The ADA (2013), states that schools should offer a safe environment for children and adolescents with diabetes. According to Klingensmith et al. (2004), as cited in Nimsgern and Camponeschi (2005), "to facilitate the appropriate care of the student with diabetes, school and day care personnel must have an understanding of diabetes and must be trained in its management and in the treatment of diabetes emergencies" (p.2). Furthermore, San Laureano et

al. (2018) state for this to be achieved, it is imperative that the teachers and the health professionals of the school receive special training in diabetes. To achieve successful diabetes management in children school personnel must be educated about diabetes care issues and provide an environment that promotes optimal diabetes management and safety (Bratina et al., 2018, Edwards et al., 2014, Herbert et al., 2015). The child with diabetes should be allowed by the teachers to participate fully in all activities while performing blood glucose testing, administering insulin as needed and eating appropriately (Bratina et al., 2018, Edwards et al., 2014, Herbert et al., 2015). Education and training of the school personnel is required regarding glycaemic control and the supervision or administration of insulin therapy treatments.

Teachers should be trained in the monitoring of diabetes and the identification of potential risks and know how to act in emergencies. Researchers such as Bratina et al. (2018); Edwards et al. (2014),-believe that teachers should be able to make insulin dose adjustments at school for specific school activities and during mealtimes. However, the current researcher contends that this places teachers at a high risk of liability. The researcher is convinced that training of teachers regarding blood glucose monitoring, the normal blood glucose range, and the effects of high or low blood glucose levels on children in the school setting is imperative (Bratina et al., 2018; Edwards et al., 2014). School personnel should be offered training in checking blood glucose and ketones and administering insulin, glucagon, and other medications according to the diabetes care plan of the child (Bratina et al., 2018; Danne et al., 2018; Edwards et al., 2014). Teachers should have adequate knowledge and training concerning the food and dietary management of the child with diabetes. (Smart et al., 2018; Ziegler & Neu, 2018).

School staff should be educated about the relationship between type 1 diabetes and physical exercise. The educators should be attentive to the risk of hypoglycaemia and the need for them to

have in their possession, rapidly acting carbohydrates such as glucose tablets, sugary drinks and glucose gels to alleviate such situations (Bratina et al., 2018, Edwards et al., 2014). Staff in schools should receive appropriate and consistent training, advice, and support regarding the signs of hyperglycaemia and the early detection and prompt treatment of hypoglycaemia. Teachers should be given clear guidelines to be followed in case the child is unwell (drowsy, vomiting, breathing heavily) and instructions for managing severe episodes of hypoglycaemia (Bratina et al., 2018, Edwards et al., 2014).

Gutierrez-Manzanedo et al. (2018), found that specific diabetes programmes for schoolteachers is a key component in improved care and control of the disease in the school environment. Furthermore, Boden et al. (2012), concur that improved information about diabetes in the school setting and improved staff training were, among other important areas for future work. Diabetes training enables school staff to play a vital role in helping students to participate in all schooling activities, thereby improving their quality of life (Pinelli et al., 2011). Jesic et al. (2016), further state that a series of interventions is required for school staff and parents to integrate pupils with diabetes into schools. Pinelli et al. (2011) reiterate that training sessions for school staff is one of the key factors that may assist in the complete integration of the child with diabetes. Ayca et al. (2012) also state that teacher training programmes, early diagnosis, and prevention of diabetes may occur due to its far-reaching impact. It is therefore clear that schools are the crucial areas for diabetes training as school professionals can play a critical role in the management of this disease (Boden et al., 2012).

Nimsgern and Camponeschi (2005) found in their study of 105 children with diabetes aged between 6 to 14 years that most of them believed that it was important for teachers, nurses, and friends to improve their knowledge on diabetes. According to Boden et al. (2012), teachers

themselves expressed concerns about being responsible for children with diabetes in their class. Some teachers expressed that the reason for these fears was due to inexperience and lack of knowledge about the condition. Most teachers on remembering their initial reaction when they were told about the presence of a child with diabetes in their class said that they felt "panicked", "terrified", "fearful", "scared" and "nervous" (Boden et al., 2012). A recent survey by Lindsay, Jarret and Hilliam (1987), indicates that the average elementary school teacher had inadequate knowledge of many aspects of diabetes. Their limited knowledge increased the risk of serious reactions or hypoglycaemic seizures. School staff did not seem to understand the symptoms of hyperglycaemia and the child's need to use the bathroom frequently. According to the research experiences of Maleki et al. (2016), it was sometimes observed that a student with diabetes was forced to drop out of school or hide the illness from others due to the teachers' lack of knowledge about the disease. For children with diabetes, the primary school years are formative for building and maintaining good health care practices that they will take with them into adulthood (Boden et al., 2012). It is therefore in the best interest of the health, safety, and education of the child that the skills advised in the clinical setting are maintained at home and the school too (Pinelli et al., 2011). For schools to offer a safe environment for children and adolescents with diabetes, the teachers and the health professionals of the school must receive special training in diabetes (ADA, 2013; San Laureano et al., 2018).

1.5 Conclusion

Consequently, numerous studies have been published on the perceptions of teachers and children's need for the correct management of diabetes at school and the need for increasing teachers' knowledge about diabetes, but limited research on the training programmes that are

currently available and being implemented successfully in schools. In a recent study in Turkey Aykan et al. (2012) found that an "important ratio of teachers will attend and benefit from training programmes designed for them; however, studies are required to establish the success rate of these programmes and their effects on relationships at school" (p. 202). Furthermore, Pansier and Schulz (2015) advise that "school-based diabetes interventions become critical to improve support, increase knowledge and confidence, protect against discrimination, and ensure a safe environment for children with diabetes" (p. 65). Therefore, this study will synthesise valuable information on training programmes for teachers that may lead to guidelines to assist teachers in the successful management of diabetes and full integration into school life for these children.

1.6 Contextualisation of This Study

This rapid review study is part of the larger diabetic research titled "Psycho-social variables in adjusting to diabetes management in adolescents and young adults" ethics number NWU-HS-2015-0111 that is undertaken by Prof E Deacon and Prof E van Rensburg of the North-West University. The overarching aim of the larger study on diabetes is to understand diabetes and develop training and therapeutic interventions across the life span. Accordingly, this study proposes to provide a thorough and quality-controlled bases of evidence of research on the programmes for teachers regarding children with diabetes.

1.7 Research Question

The research question is:

What training programmes are available nationally and internationally to equip teachers to manage children's diabetes at school?

1.8 Aim

The proposed study aims to identify and collate pertinent information on training programmes that are available to train teachers in the management of children's diabetes at school. The study provided a comprehensive account of the methods used to train the teachers, as well as the content of the training programmes. Thereafter suggestions were made for the further development and implementation of such training programmes in South African schools.

1.9 Research Methodology and Design

1.9.1 Research Design

A rapid review approach was used to conduct this study, and the data collated used to answer the research question. According to Grant and Booth (2009), a rapid review uses a systematic review approach to search for readily available research but also to provide an assessment on what is already known about a practice issue or policy. It follows an explicit method and is rigorous in providing valid procedures to shorten timescales (Grant & Booth, 2009). The rapid review, however, adheres to the key principles of a systematic review that include maintaining transparency and avoiding bias (Schünemann & Moja, 2015).

1.9.2 Process of Analysis of Literature

The process followed five distinct stages to identify available literature.

1.9.2.1 Stage 1: Search Strategy

The search strategy entailed the identification of certain keywords and databases.

Keywords. Keywords were identified through a perusal of the available journal articles related to the topic through a scope search. The reviewer entered the keyword configuration below in the advanced search section in the required levels with corresponding all text, title, and abstract indications. The keywords were matched with appropriate synonyms and corresponding Boolean operators such as AND or to achieve a more accurate result. Lastly, to refine the search, the keyword search was combined with the inclusion and exclusion criteria.

Level one. Diabetes OR diabetes management

Title search

AND

Level two. Teacher* OR educator* OR school staff

All text search

AND

Level three. Training program* OR educational program

OR educational training

Abstract search

AND

Level four. Primary school OR elementary school

OR primary education OR elementary education

All text search

Databases. The EBSCO Discovery Services (EDS), which is available from the North-West University library portal was utilised as the primary search engine as it provides access to numerous other data bases such as Academic Search Premier, CINAHL with full text, Science Direct and PsycINFO. These, among other, databases were included in the search strategy.

1.9.2.2 Stage 2: Critical Appraisal of Articles Using Titles, Abstracts and the Inclusion and Exclusion Criteria

Inclusion and Exclusion Criteria. Studies that adhere to the following inclusion criteria were considered in the study. Studies published from the year 2000 to 2019 were included as diabetes education programmes for teachers started gaining momentum only after the year 2000. Only studies with primary school teachers who educate children between the ages of six and thirteen years who have diabetes were included. This age group of children still requires assistance with their diabetes medication regimen as they are not yet autonomous (San Laureano et al., 2018).

Inclusion of studies was limited strictly to full text, peer-reviewed studies published in English and/or Afrikaans; qualitative, quantitative, and mixed-method studies; PhD theses, review studies, masters, and mini-dissertations.

Non-peer reviewed studies, conference proceedings, and studies published in any other language besides English where a translated version was not timeously available were excluded.

1.9.2.3 Stage 3: Critical Appraisal of the Quality of the Selected Articles

The selected studies resulting from the keyword search were subjected to a systematic critical appraisal process. The current researcher and the study leaders were involved in the process. The relevance of the identified studies was done independently by each reviewer using the following relevance table. Each article's title and abstract were examined carefully by each reviewer to

determine whether the study is relevant to the current research or not. Thereafter both the reviewers met to discuss their compiled lists to reach consensus.

Relevant	Irrelevant	Uncertain
----------	------------	-----------

After consensus had been reached regarding the relevant studies to be included, the chosen studies were critically appraised for quality independently by each reviewer. Each article was rated by the reviewers using the following instrument. Once each reviewer had compiled their list, the reviewers discussed any discrepancies and achieved consensus.

The articles were appraised using the following appraisal instrument adapted from the Joanna Briggs Institute (2014) guidelines for qualitative and quantitative studies.

Criteria	Yes	No	N/A
1. Is there a clear problem statement?	☐	☐	☐
2. Is there a clear research question?	☐	☐	☐
3. Are the aims and objectives clear?	☐	☐	☐
4. Does the study have a clear and valid research methodology?	☐	☐	☐
5. Are the results of the study clearly indicated, reported, and discussed (tables, figures, themes etc.)?	☐	☐	☐
6. Is there a clear conclusion for the study?	☐	☐	☐

1.9.2.4 Stage 4: Data Extraction

The selected studies that were agreed upon by both reviewers were exported to an Excel spreadsheet. The spreadsheet was comprehensive and included the following information about each study, the title, authors and date of publication, the content and method of the training programme and the conclusions and findings. The key information extracted was used to answer the research question, namely:

Which training programmes are available nationally and internationally to equip teachers to manage children's diabetes at school?

1.9.2.5 Stage 5: Data Analysis

This rapid review study analysed the data using a qualitative analysis approach. The thematic synthesis approach was used as it is a widely accepted method used in research (Thomas et al., 2017). This method makes use of clear guidelines, and the synthesis followed three rigorous phases which are:

1. Coding text
2. Developing descriptive themes
3. Generating analytical themes (Thomas & Harden, 2008).

During the first phase, the coding text phase, themes are identified from the texts similar to thematic analysis. The reviewers read all the selected studies repeatedly to become familiar with them. The studies were carefully analysed and studied line by line. Each relevant text line was given a code. Texts that had similar meaning and concepts from each of these studies were highlighted and linked together (Thomas et al., 2017). This phase allowed 'translation' of codes between studies leading to the second phase, the developing descriptive themes phase (Thomas

& Harden, 2008). The codes generated in phase one were analysed for differences and similarities, and this allowed them to be grouped in a hierarchical structure (Thomas & Harden, 2008). The identified themes from the coded text were then clustered together into descriptive themes. Finally, in the last phase, the generating analytical themes phase, analytical themes were established by having formulated new explanations and conceptualisations that answered the review questions (Thomas et al., 2017). The descriptive themes from phase two were interpreted and inferred to facilitate new concepts and hypotheses (Thomas & Harden, 2008). These phases were followed independently by the reviewers, and the resulting analyses were compared and discussed until consensus.

1.10 Ethical Considerations

Ethics approval for this rapid review study has been obtained (ethics number NWU-00940-19-A1). It did not involve any human participants; thus, the risk of harm was minimal. Nevertheless, scientific rigour is essential for any study to be precise and thorough in conveying findings accurately (Gnyawali & Song, 2016). To achieve this, both the reviewers adhered to the specific processes detailed in this section with regards to the search strategy, the relevance of articles, quality appraisal of articles, data extraction, and data analysis. The results and findings were reported scientifically and accurately.

This study upheld the four essential aspects suggested by Krefting (1991), namely credibility, confirmability, transferability, and dependability.

Credibility. The primary and secondary reviewers ensured that all results are accurate, and findings are transparent (Wager & Wiffin, 2011). The rapid review methodology was strictly

adhered to, and the secondary reviewer continuously monitored the findings and progress of the primary reviewer to guarantee credibility.

Confirmability. For this research study, confirmability was ensured by following the steps outlined in this proposal with regards to quality appraisal of articles, data extraction and data analysis. A preliminary scope review was done to avoid redundancy and duplication. All references were done using the APA guidelines to prevent plagiarism.

Transferability. Bambra (2011) states that the uniqueness of systematic review is its replicability and transferability. To ensure that no bias is involved in selecting articles, clear inclusion and exclusion criteria were decided and adhered to before the quality appraisal stage (Vergnes et al., 2010). Therefore, despite the different contexts, the data gathered was seen following the research question. The findings were thus able to be transferred to the South African school context.

Dependability. The primary reviewer followed the procedures and processes described in this section with regards to data extraction, analysis and so on; thus, ensuring the dependability and scientific integrity of the study.

1.11 Outline of the Study

Section 1 of the mini-dissertation includes a brief introduction, an overview on diabetes mellitus, the different types of diabetes, Type 1 diabetes and Type 2 diabetes, the general consequences of diabetes, the consequences of diabetes for the child in the school context, the management of diabetes, the role of teachers in diabetes management in the school context, the training of teachers to manage diabetes at school, and the research design and methodology.

Section 2 of the mini-dissertation consists of the guidelines for the *South African Journal of Education* and the proposed manuscript titled: Training of teachers in the management of children's diabetes at school: A Rapid Review.

In Section 3 of the mini-dissertation, the researcher completes a critical self-reflection, and a complete reference list is added.

1.12 References

- Abraham, M. B., Jones, T. W., Naranjo, D., Karges, B., Oduwole, A., Tauschmann, M., & Maahs, D. M. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Assessment and management of hypoglycemia in children and adolescents with diabetes. *Pediatric Diabetes*, 19, 178–192. <https://doi.org/10.1111/pedi.12698>
- Adolfsson, P., Riddell, M. C., Taplin, C. E., Davis, E. A., Fournier, P. A., Annan, F., Scaramuzza, A. E., Hasnani, D., & Hofer, S. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Exercise in children and adolescents with diabetes. *Pediatric Diabetes*, 19, 205–226. <https://doi.org/10.1111/pedi.12755>
- American Diabetes Association. (2013). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, 36(1, Suppl.), S67–S74.
- Aycan, Z., Önder, A., Çetinkaya, S., Bilgili, H., Yıldırım, N., Baş, V. N., Kendirci, H. N. P., & Ağladioğlu, S. Y. (2012). Assessment of the knowledge of diabetes mellitus among schoolteachers within the scope of the managing diabetes at school program. *Journal of Endocrinology and Metabolism*, 4(4), 199–203. <https://doi.org/10.4274/jcrpe.756>
- Bambra, C. (2011). Real world reviews: A beginner's guide to undertaking systematic reviews of public health policy interventions. *Journal of Epidemiology and Community Health*, 65(1), 14–19. <https://doi.org/10.1136/jech.2009.088740>
- Bobo, N., Wyckoff, L., Patrick, K., White, C., Glass, S., Carlson, J. P., & Perreault, C. (2011). A collaborative approach to diabetes management: The choice made for Colorado schools. *The Journal of School Nursing*, 27(4), 269–281. <https://doi.org/10.1177/1059840511408323>

- Boden, S., Lloyd, C. E., Gosden, C., Macdougall, C., Brown, N., & Matyka, K. (2012). The concerns of school staff in caring for children with diabetes in primary school. *Pediatric Diabetes*, 13(6), e6-e13. <https://doi.org/10.1111/j.1399-5448.2011.00780.x>
- Bratina, N., Forsander, G., Annan, F., Wysocki, T., Pierce, J., Calliari, L. E., Pacaud, D., Adolfsson, P., Dovč, K., Middlehurst, A., & Goss, P. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Management and support of children and adolescents with type 1 diabetes in school. *Pediatric Diabetes*, 19(17, Suppl.), S287–S301. <https://doi.org/10.1111/pedi.12743>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Centers for Disease Control and Prevention. (2017, March 7). *National Diabetes Statistics Report*. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>
- Craig, M. E., Jefferies, C., Dabelea, D., Balde, N., Seth, A., & Donaghue, K. C. (2014). Definition, epidemiology, and classification of diabetes in children and adolescents. *Pediatric Diabetes*, 15(20, Suppl.), S4–S17. <https://doi.org/10.1111/pedi.12186>
- Danne, T., Phillip, M., Buckingham, B. A., Jarosz-Chobot, P., Saboo, B., Urakami, T., Battelino, T., Hanas, R., & Codner, E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Insulin treatment in children and adolescents with diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S115–S135. <https://doi.org/10.1111/pedi.12718>
- Delamater, A. M., de Wit, M., McDarby, V., Malik, J. A., Hilliard, M. E., Northam, E., & Acerini, C. L. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: psychological

- care of children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S237–S249. <https://doi.org/10.1111/pedi.12736>
- DiMeglio, L. A., Acerini, C. L., Codner, E., Craig, M. E., Hofer, S. E., Pillay, K., & Maahs, D. M. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S105–S114. <https://doi.org/10.1111/pedi.12737>
- Dobbins, M. (2017). *Rapid review guidebook steps for conducting a rapid review*. Hamilton Resource Details National Collaborating Centre for Methods and Tools.
- Edwards, D., Noyes, J., Lowes, L., Spencer, L. H., & Gregory, J. W. (2014). An ongoing struggle: A mixed-method systematic review of interventions, barriers and facilitators to achieving optimal self-care by children and young people with Type 1 diabetes in educational settings. *BMC Pediatrics*, 14(1), 1–27. <https://doi.org/10.1186/1471-2431-14-228>
- Erhardt, E., & Molnár, D. (2004). Is type 2 diabetes mellitus a significant problem in European adolescents? *Scandinavian Journal of Nutrition*, 48(4), 155–160. <https://doi.org/10.1080/11026480410000445>
- Gnyawali, D. R., & Song, Y. (2016). Pursuit of rigor in research: Illustration from coopetition literature. *Industrial Marketing Management*, 57, 12–22. <https://doi.org/10.1016/j.indmarman.2016.05.004>
- Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91–108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>

- Gutiérrez-Manzanedo, J. V., Carral-San Laureano, F., Moreno-Vides, P., de Castro-Maqueda, G., Fernández-Santos, J. R., & Ponce-González, J. G. (2018). Teachers' knowledge about Type 1 diabetes in south of Spain public schools. *Diabetes Research and Clinical Practice*, 143, 140–145. <https://doi.org/10.1016/j.diabres.2018.07.013>
- Helgeson, V. S., Orchard, T. J., Seltman, H., Becker, D., & Libman, I. (2019). Psychosocial predictors of diabetes risk factors and complications: An 11-year follow-up. *Health Psychology*, 38(7), 567–576. <https://doi.org/10.1037/hea0000730>
- Herbert, L. J., Clary, L., Owen, V., Monaghan, M., Alvarez, V., & Streisand, R. (2015). Relations among school/daycare functioning, fear of hypoglycaemia and quality of life in parents of young children with type 1 diabetes. *Journal of Clinical Nursing*, 24(9–10), 1199–1209. <https://doi.org/10.1111/jocn.12658>
- International Diabetes Federation. 2019. *IDF Diabetes Atlas* (9th ed.). <https://www.diabetesatlas.org/en/resources>
- Ješić, M. D., Milenković, T., Mitrović, K., Todorović, S., Zdravković, V., Ješić, M. M., Bošnjović-Tucaković, T., Marković, S., Vorgučin, I., Stanković, S., & Sajić, S. (2016). Problems in diabetes management in school setting in children and adolescents with Type 1 diabetes in Serbia. *Vojnosanitetski pregled*, 73(3), 273–276. <https://doi.org/10.2298/VSP150203007J>
- Joanna Briggs Institute. 2014. *Joanna Briggs Institute reviewers' manual 2014*. <https://nursing.lsuhsu.edu/JBI/docs/ReviewersManuals/Economic.pdf>

- Kalra, S., Mukherjee, J. J., Venkataraman, S., Bantwal, G., Shaikh, S., Saboo, B., Das, A. K., & Ramachandran, A. (2013). Hypoglycemia: The neglected complication. *Indian Journal of Endocrinology and Metabolism*, 17(5), 819–834. <https://doi.org/10.4103/2230-8210.117219>
- Kaufman, F. R., Gallivan, J. M., & Warren-Boulton, E. (2009). Overview of diabetes in children and teens. *American Journal of Health Education*, 40(5), 259–263. <https://doi.org/10.1080/19325037.2009.11770768>
- Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, 96(3), 118–121. <https://doi.org/10.1258/jrsm.96.3.118>
- Khangura, S., Konnyu, K., Cushman, R., Grimshaw, J., & Moher, D. (2012). Evidence summaries: The evolution of a rapid review approach. *Systematic Reviews*, 1(1), 1–9. <https://doi.org/10.1186/2046-4053-1-10>
- Kharroubi, A. T., & Darwish, H. M. (2015). Diabetes mellitus: The epidemic of the century. *World Journal of Diabetes*, 6(6), 850–867. <https://doi.org/10.4239/wjd.v6.i6.850>
- Krefting, L. (1991). Rigor in qualitative research: Assessment of trustworthiness. *The American Journal of Occupational Therapy*, 45(3), 214–222. <https://doi.org/10.5014/ajot.45.3.214>
- Lasecki, K., Olympia, D., Clark, E., Jenson, W., & Heathfield, L. T. (2008). Using behavioral interventions to assist children with type 1 diabetes manage blood glucose levels. *School Psychology Quarterly*, 23(3), 389–406. <https://doi.org/10.1037/1045-3830.23.3.389>

- Lee, J. M., Herman, W. H., McPheeters, M. L., & Gurney, J. G. (2006). An epidemiologic profile of children with diabetes in the US. *Diabetes Care*, 29(2), 420–421.
<https://doi.org/10.2337/diacare.29.02.06.dc05-2182>
- Lindsay, R., Jarrett, L., & Hilliam, K. (1987). Elementary schoolteachers' understanding of diabetes. *The Diabetes Educator*, 13(3), 312–314.
<https://doi.org/10.1177/014572178701300315>
- Lorenzi, D. G., & Trenney, R. (2015). Being prepared to teach and coach students with diabetes. *Journal of Physical Education, Recreation and Dance*, 86(4), 5–6.
<https://doi.org/10.1080/07303084.2015.1009806>
- Mahmud, F. H., Elbarbary, N. S., Fröhlich-Reiterer, E., Holl, R. W., Kordonouri, O., Knip, M., Simmons, K., & Craig, M. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Other complications and associated conditions in children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S275–S286. <https://doi.org/10.1111/pedi.12740>
- Maleki, M. M., Talakoub, S., & Abazari, P. (2016). Investigating the effect of teacher training program on understanding teachers' supportive behaviors by students with diabetes. *International Journal of Medical Research & Health Sciences*, 5(12), 186–190.
- Marks, A., Wilson, V., & Crisp, J. (2013). The management of type 1 diabetes in primary school: Review of the literature. *Issues in Comprehensive Pediatric Nursing*, 36(1-2), 98–119.
<https://doi.org/10.3109/01460862.2013.782079>
- Nimsgern, A., & Camponeschi, J. (2005). Implementing a new diabetes resource for Wisconsin schools and families. *Preventing Chronic Disease*, 2.

- Pansier, B., & Schulz, P. J. (2015). School-based diabetes interventions and their outcomes: A systematic literature review. *Journal of Public Health Research*, 4(1), 467.
<https://doi.org/10.4081/jphr.2015.467>
- Patterson, C., Guariguata, L., Dahlquist, G., Soltész, G., Ogle, G., & Silink, M. (2014). Diabetes in the young: A global view and worldwide estimates of numbers of children with type 1 diabetes. *Diabetes Research and Clinical Practice*, 103(2), 161–175.
<https://doi.org/10.1016/j.diabres.2013.11.005>
- Peppas, A., Asonitou, K., & Koutsouki, D. (2011). Exercise training in students with diabetes: The role of pe teacher at school. *SportLogia*, 7(2), 177–184.
<https://www.sportlogia.com/no4engl/10.pdf>
- Pérez-Marín, M., Gomez-Rico, I., & Montoya-Castilla, I. (2015). Type 1 diabetes mellitus: psychosocial factors and adjustment of pediatric patient and his/her family. Review. *Arch Argent Pediatr*, 113(2), 158–162. <https://doi.org/10.5546/aap.2015.158>
- Pheiffer, C., Pillay-van Wyk, V., Joubert, J. D., Levitt, N., Nglazi, M. D., & Bradshaw, D. (2018). The prevalence of type 2 diabetes in South Africa: A systematic review protocol. *BMJ open*, 8(7), e021029. <https://doi.org/10.1136/bmjopen-2017-021029>
- Phelan, H., Lange, K., Cengiz, E., Gallego, P., Majaliwa, E., Pelicand, J., Smart, C., & Hofer, S. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Diabetes education in children and adolescents. *Pediatric Diabetes*, 19(27, Suppl.), 75–83.
<https://doi.org/10.1111/pedi.12187>
- Pinelli, L., Zaffani, S., Cappa, M., Carboniero, V., Cerutti, F., Cherubini, V., Chiarelli, F., Colombini, M. I., La Loggia, A., Pisanti, P., & Vanelli, M. (2011). The ALBA project: An

- evaluation of needs, management, fears of Italian young patients with type 1 diabetes in a school setting and an evaluation of parents' and teachers' perceptions. *Pediatric Diabetes*, 12(5), 485–493. <https://doi.org/10.1111/j.1399-5448.2010.00722.x>
- Punthakee, Z., Goldenberg, R., & Katz, P. (2018). Definition, classification and diagnosis of diabetes, prediabetes and metabolic syndrome. *Canadian Journal of Diabetes*, 42(1, Suppl.), S10–S15. <https://doi.org/10.1016/j.cjcd.2017.10.003>
- Raghupathy, P. (2015). Diabetic ketoacidosis in children and adolescents. *Indian Journal of Endocrinology and Metabolism*, 19(7), 55–57. <https://doi.org/10.4103/2230-8210.155403>
- Reinehr, T. (2013). Type 2 diabetes mellitus in children and adolescents. *World Journal of Diabetes*, 4(6), 270–281. <https://doi.org/10.4239/wjd.v4.i6.270>
- San Laureano, F. C., Manzanedo, J. V. G., Vides, P. M., de Castro Maqueda, G., Santos, J. R. F., González, J. G. P., & Ortega, M. D. C. A. (2018). Teachers' attitudes and perceptions about preparation of public schools to assist students with Type 1 diabetes. *Endocrinología, Diabetes y Nutrición*, 65(4), 213–219. <https://doi.org/10.1016/j.endien.2018.04.003>
- Sherry, N. A., & Levitsky, L. L. (2008). Management of diabetic ketoacidosis in children and adolescents. *Pediatric Drugs*, 10(4), 209–215. <https://doi.org/10.2165/00148581-200810040-00002>
- Smart, C. E., Annan, F., Higgins, L. A., Jelleryd, E., Lopez, M., & Acerini, C. L. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Nutritional management in children and adolescents with diabetes.

- Siminerio, L. M., & Koerbel, G. (2000). A diabetes education program for school personnel. *Practical Diabetes International*, 17(6), 174–177. [https://doi.org/10.1002/1528-252X\(200009\)17:6<174::AID-PDI105>3.0.CO;2-4](https://doi.org/10.1002/1528-252X(200009)17:6<174::AID-PDI105>3.0.CO;2-4)
- Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8(45). <https://doi.org/10.1186/1471-2288-8-45>
- Thomas, J., O’Mara-Eves, A., Kneale, D., & Shemilt, I. (2017). Synthesis methods for combining and configuring textual or mixed methods data. In D. Gough, S. Oliver & J. Thomas (Eds.), *An introduction to systematic reviews* (pp. 182–209). Sage.
- Tolbert, R. (2009). Managing type 1 diabetes at school: An integrative review. *The Journal of School Nursing*, 25(1), 55–61. <https://doi.org/10.1177/1059840508329295>
- Tricco, A. C., Antony, J., Zarin, W., Striffler, L., Ghassemi, M., Ivory, J., Perrier, L., Hutton, B., Moher, D., & Straus, S. E. (2015). A scoping review of rapid review methods. *BMC Medicine*, 13(1), 224. <https://doi.org/10.1186/s12916-015-0465-6>
- Vergnes, J. N., Marchal-Sixou, C., Nabet, C., Maret, D., & Hamel, O. (2010). Ethics in systematic reviews. *Journal of Medical Ethics*, 36(12), 771–774. <https://doi.org/10.1136/jme.2010.039941>
- Wager, E., & Wiffin, P. J. (2011). Ethical issues in preparing and publishing systematic reviews. *Journal of Evidence-based Medicine*, 4(2), 130–134. <https://doi.org/10.1111/j.1756-5391.2011.01122.x>

- Wolfsdorf, J. I., Glaser, N., Agus, M., Fritsch, M., Hanas, R., Rewers, A., Sperling, M. A., & Codner, E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatric Diabetes*, 19(27, Suppl.), S155–S177. <https://doi.org/10.1111/pedi.12701>
- Ziegler, R., & Neu, A. (2018). Diabetes in childhood and adolescence: A guideline-based approach to diagnosis, treatment, and follow-up. *Deutsches Ärzteblatt International*, 115(9), 146–156. <https://doi.org/10.3238/arztebl.2018.0146>

Section 2: Manuscript for Submission

2.1 Guidelines for Submission: South African Journal of Education

2.1.1 Editorial Policy

The South African Journal of Education (SAJE) publishes original research articles reporting on research that fulfils the criteria of a generally accepted research paradigm; review articles, intended for the professional scientist and which critically evaluate the research done in a specific field in education; and letters in which criticism is given of articles that appeared in this Journal. Research articles of localised content, i.e. of interest only to specific areas or specialists and which would not appeal to the broader readership of the Journal, should preferably not be submitted. Authors should indicate the relevance of the study for education research when submitting manuscripts, where the education system is characterised by transformation, and/or an emerging economy/development state, and/or scarce resources. In addition, a brief narrative account/description of ethical issues/aspects should be included in articles that report on empirical findings.

All manuscripts will be submitted to referees (national and/or international), who hold documented expertise in the area the manuscripts addresses. When reviews are received, an editorial decision will be reached to either accept the article, reject the article, request a revision (in some cases for a second or third round of peer review), or request arbitration. As a rule, only one article per author or co-author will be accepted per year for refereeing and possible publication.

Authors bear full responsibility for the accuracy and recency of the factual content of their contributions. A signed declaration in respect of originality must accompany each manuscript.

On submission of the manuscript, the author(s) must present a written undertaking that the article has not been published or is not being presented for publication elsewhere.

All manuscripts will be put through Turnitin upon receipt of the manuscript. An arbitrary guideline of a 15% similarity index applies, even though Turnitin reports are interpreted qualitatively. The use of common methodological terms and scientific concepts does not necessarily imply plagiarism. Furthermore, repetition of other work in sections that focus on content and new knowledge will not be allowed. Word-for-word copying of the work of others should be indicated by means of double quotation marks, and reference to the author, year of publication and relevant page number, e.g. “Brown (1997:40-41)”.

Redundancy/self-plagiarism is also unacceptable, where authors reproduce sections of their own previously published work without using quotation marks, or where authors create several papers slightly differing from each other, and then submit these to different journals without acknowledging this (Information adapted from Code of Ethics for the Journal of International Business Studies (n.d.). Available at http://www.palgrave-journals.com/jibs/author_instructions.html#Ethical-guidelines. Accessed 20 March 2013).

Plagiarism and redundancy/self-plagiarism will be dealt with as follows:

- For papers already published: a formal notice of redundant publication will be issued to readers in the next issue of the journal. The Executive Editor has the right to refuse submissions from such authors for a certain period of time (Information adapted from Redundant Publication: The Editorial Policy Committee of the Council of Science Editors (n.d.). Available at http://natajournals.org/userimages/ContentEditor/1256771128861/redundant_publication.pdf. Accessed 20 March 2013).

- In cases of major concern, authors will be denied the privilege of publishing the relevant paper in the South African Journal of Education.
- In cases of minor concern, authors will be asked to rephrase the duplicated sentences. (Information adapted from Code of Ethics for the Journal of International Business Studies (n.d.). Available at http://www.palgrave-journals.com/jibs/author_instructions.html#Ethical-guidelines. Accessed 20 March 2013).

Author(s) must furthermore ensure that the language in the manuscript is professionally edited. Upon submission, the name and address of the language editor must be provided. Copyright of all published material remains vested in the Education Association of South Africa (EASA).

2.1.2 Preparation and Structure of Manuscripts

The manuscript, including abstract, figure captions, tables, etc. should be typed on A4 paper and the pages numbered consecutively. Manuscripts should be typed in Microsoft Word format with text in Arial font, 12 point, and 1.5 line spacing. All margins should be 2.54 cm. The total number of pages should preferably not exceed 17 pages ($\pm$ 6,000 words).

The title of the manuscript should be brief (maximum 15 words). The title should be followed by the author(s) name(s), affiliation(s) (Department and University), and an e-mail address for the corresponding author.

An abstract in English (approximately 190 words) must be provided, followed by up to 10 keywords, presented alphabetically.

The text of the article should be structured according to the following unnumbered sections, which may include sub-sections:

- Introduction and/or background
- Literature review
- Theoretical/Conceptual Framework
- Methodology
- Results/findings
- Discussion
- Acknowledgements
- References

Figures should be clear, black/white originals, on separate pages — not embedded in the text. Grey or coloured shading must be avoided. Tables/figures should include a brief descriptive heading/caption and be numbered consecutively, using the decimal point rather than the decimal comma.

2.1.3 References

Only sources cited in the text must be listed in the list of references, in alphabetical order, at the end of the manuscript. References should be presented as indicated in the examples below. Special attention should be paid to the required punctuation. References are cited in the text by the author(s) name(s) and the year of publication in brackets (Harvard method), separated by a comma, e.g. (Brown, 1997). If several articles by the same author and from the same year are cited, the letters a, b, c, etc. should be added after the year of publication, e.g. (Brown, 1977a). Page references in the text should follow a colon after the date, e.g. (Brown, 1997:40-48).

In works by three or more authors the surnames of all authors should be given in the first reference to such a work yet in subsequent references to such this work, only the name of the first author is given, followed by the abbreviation et al., e.g. (Ziv et al., 1995).

If reference is made to an anonymous item in a newspaper, the name of the newspaper is given in brackets, e.g. (Daily News, 1999).

For personal communications (oral or written) the relevant person and personal communication should be indicated in brackets, e.g. (M Smith, pers. comm.).

Format for referencing journal articles:

Johnson DW & Johnson RT 1999. Gifted students illustrate co-operative Learning. *Educational Leadership*, 50(1):60-61. <https://doi.org/10.15700/el.1999.50>

Books:

Van Zyl R (ed.) 1994. *Recent advances in classroom research*. San Diego, CA: McGraw-Hill.

Chapters in books:

Dukzec S 1988. Gender issues. In D Hicks & J Brown (eds). *Education for peace*. London, England: Routledge.

Unpublished theses or dissertations:

Squelch J 1991. Teacher training for multicultural education in a multicultural society. Mediterranean dissertation. Pretoria, South Africa: University of South Africa.

Anonymous newspaper references:

Citizen 1996. Education for all, 22 March.

Electronic references:

Published under author's name:

Wilson J 2000. The blame culture. *British Educational Research Journal*, 26. Available at <http://www.govsources/gtp%access>. Accessed 20 April 2005.

Website references with no author:

These references are not archival and are therefore subject to change in any way and at any time. If it is essential to present them, however these should be included in a numbered endnote and not in the reference list.

2.1.4 Submission of Manuscripts

Manuscripts can be submitted electronically by e-mail or via the internet. All manuscripts should be submitted in MS Word format.

2.2 Manuscript: Training of teachers in the management of children's diabetes at school:

A rapid review

Corresponding Author

Sameeha Elias

19 Grace Crescent

Eldoglen, Centurion

0157

Email: s.akoon@hotmail.com

Co-author

Prof Esmé van Rensburg

School of Psychosocial and Behavioural Sciences

North-West University – Potchefstroom

Email: esme.vanrensburg@nwu.ac.za

Co-author

Prof Elmari Deacon

School of Psychosocial and Behavioural Sciences

North-West University – Potchefstroom

Email: elmari.deacon@nwu.ac.za

Training of teachers in the management of children's diabetes at school: A rapid review

Abstract

The aim of this study was to review scientific literature on the training programmes available to equip teachers to manage children's diabetes at school. A rapid review was conducted by identifying potential studies through EBSCO Discovery Services and employing thematic synthesis to analyse the data. The findings of the review indicate that out of the eleven studies retained, almost all the studies increased the teachers' knowledge on diabetes and six of the studies increased the teachers' confidence in caring and managing children with diabetes at school. Four of the studies were found to be cost-effective. Only one study was found to be inefficacious and did not increase the teachers' knowledge of diabetes. The content of most of the programmes included both a theory and a practical element. Recommendations include the need for further comprehensive studies to evaluate training programmes for teachers as well as more comparative studies to determine the effectiveness between the different training methods and for further research to be undertaken in African countries on diabetes programmes for teachers. Guidelines for a similar training programme in South African schools may include face to face training, online training or both specified to the infrastructure of the school.

Keywords: Children, Diabetes Mellitus, Rapid Review, Teachers, Type 1 diabetes.

Introduction

Diabetes mellitus is an ever-increasing disease that is prevalent across all age groups and one of the most common chronic diseases affecting school-aged children (Pansier and Schulz, 2015; Taha, Rahme, Mesbah, Mahmoud, AlKandari, Othman, Sharaikha, Lari, AlBeloushi, Saad and Arefanian, 2018). The International Diabetes Federation (IDF) reports that the incidence of school-going children affected by this disease worldwide is on the increase (IDF, 2019). It is estimated that around 98,200 children

and adolescents under the age of fifteen years are diagnosed with Type 1 diabetes annually and 1,110,100 children and adolescents younger than 20 years are estimated to have Type 1 diabetes globally. Due to the scarcity of information, accurate figures for the incidence of diabetes in children in Africa are unavailable. In South Africa particularly, the last accurate account of the prevalence of diabetes in youth aged 0 to fourteen years was 8.27% in 2015 with an incidence rate of 0.8/100 000 (Kalweit, Briers and Olorunju, 2015).

The rising number has a significant impact on the social and economic burden of a country. This effect is compounded in the South African context due to the lack of equal resources and care for all children with diabetes (Kalweit et al., 2015). South Africa has a marked difference between the healthcare available to patients in the public sector versus those in the private sector (Kalweit et al., 2015). Many patients have a delayed diagnosis of diabetes which often occurs upon the presentation of complications related to the disease (Nuche-Berenguer and Kupfer, 2018). Furthermore, South Africa's health care centres, particularly in rural areas, reported poor capacity to diagnose the disease due to insufficient testing equipment and glucose measuring tools (Nuche-Berenguer and Kupfer, 2018). Although access to diabetes medication has improved greatly in South Africa post-apartheid, these initiatives do not always reach the rural areas. Consequently, the primary healthcare system in South Africa needs empowerment to be able to influence the less developed areas (Nuche-Berenguer and Kupfer, 2018).

Primary healthcare in South Africa is struggling. Our education system is beset by difficulties. Against this background the inevitable consequences of the ineffective management of diabetes are far-reaching. Matters of cause include acute complications such as hypoglycaemia and diabetic ketoacidosis (Bratina, Forsander, Annan, Wysocki, Pierce, Calliari, Pacaud, Adolfsson, Dovč, Middlehurst and Goss, 2018; Ziegler and Neu, 2018). If untreated, hypoglycaemia in school-aged children can result in poor cognitive function, negative psychosocial consequences, and harmful physiological reactions (Abraham, Jones, Naranjo, Karges, Oduwole, Tauschmann and Maahs, 2018). Diabetes education regarding hypoglycaemia is critical to its prevention and schoolteachers should be adequately trained to recognise the early warning signs of

hypoglycaemia and to act against low levels of blood sugar timeously and effectively (Abraham et al., 2018). Diabetic ketoacidosis is a serious medical emergency, and if untreated can lead to death (Wolfsdorf, Glaser, Agus, Fritsch, Hanas, Rewers, Sperling and Codner, 2018).

Children may because of poor management be at risk of other diabetes complications, affecting their physical, psychological, and social well-being. These may include stigma and discrimination, lack of support to participate in extracurricular activities (Pansier and Schulz, 2015). Children with diabetes have a greater incidence of behavioural issues, depression, anxiety, stress-related mental disorders, eating disorders, poor academic performance and poor quality of life when compared to their metabolically healthy counterparts (Delamater, de Wit, McDarby, Malik, Hilliard, Northam and Acerini, 2018; Maleki, Talakoub and Abazari, 2016; Pansier and Schulz, 2015; Ziegler and Neu, 2018).

Children spend a large portion of their time (approximately 6 to 10 hours) a day at school or engaging in after school activities (Ješić, Milenković, Mitrović, Todorović, Zdravković, Ješić, Bošnjović-Tucaković, Marković, Vorgučin, Stanković and Sajić, 2016; Pansier and Schulz, 2015; Tolbert, 2009) and therefore require support to manage their diabetes at school. Teachers, depending on the child's age, may be required to assist with insulin regimens, monitoring hyper and hypoglycaemia (Kaufman, Gallivan and Warren-Boulton, 2009; Marks Wilson and Crisp, 2013; Pansier and Schulz, 2015), and correct nutrition (Jéšić et al., 2016; Kaufman et al., 2009; Siminerio and Koerbel, 2000). Teachers will, therefore have to fulfil the role of caregiver, providing emotional support in addition to being the educator at school (Boden, Lloyd, Gosden, Macdougall, Brown and Matyka, 2012).

It is imperative that the teachers and the non-medical staff of the school receive special training in diabetes to maximise children's safety at school (Driscoll, Volkening, Haro, Ocean, Wang, Jackson, Clougherty, Hale, Klingensmith, Laffel and Deeb, 2015; San Laureano, Manzanedo, Vides, de Castro Maqueda, Santos González and Ortega, 2018). Gutiérrez-Manzanedo, Carral-San Laureano, Moreno-Vides, de Castro-Maqueda, Fernández-Santos and Ponce-González (2018) found that specific diabetes programmes for schoolteachers is a key component in improved care and control of the

disease in the school environment. Diabetes training enables school staff to play a vital role in integrating students fully into school, thereby improving their quality of life (Jéšic et al., 2016; Pinelli, Zaffani, Cappa, Carboniero, Cerutti, Cherubini, Chiarelli, Colombini, La Loggia, Pisanti and Vanelli, 2011). Aycan, Önder, Çetinkaya, Bilgili, Yıldırım, Baş, Kendirci and Aǧladioǧlu (2012) state that through teacher training programmes, early diagnosis and prevention of diabetes may occur due to its far-reaching impact. The role of teachers in South Africa is thus crucial due to the discrepancies in the accessibility of treatment for children. It may mitigate the effects of the current primary healthcare shortfalls.

Numerous research studies have been published about the perceptions of teachers regarding diabetes care and management, the children's need for the correct management of diabetes at school and the need for increasing teachers' knowledge about diabetes (Aycan et al., 2012; Boden et al., 2012; Gutierrez-Manzanedo et al., 2018; Jéšic et al., 2016; Kaufman et al., 2009; Lindsay, Jarrett and Hilliam, 1987; Pinelli et al., 2011 San Laureano et al., 2018; Schwartz, Denham, Heh, Wapner and Shubrook 2010; Tolbert, 2009) however there is a paucity of studies about the training programmes that are currently available and being implemented successfully in schools. A systematic literature review by Pansier and Schulz (2015), to assess the outcomes of diabetes interventions at school, conducted between the years 2000 and 2013 was the last review study conducted. The review by Pansier and Schulz (2015) was based on only fifteen studies and included programmes for school personnel and school nurses. Pansier and Schulz (2015, found that the seven studies undertook before 2006 mainly focused on the education of school personnel – including school nurses and teachers – and reported gains in knowledge and perceived confidence of the school staff. Following 2006, the interventions of the remaining eight studies became more comprehensive. They concentrated on promoting better care organisation and creating a safe school environment for children with diabetes by targeting a more collaborative approach to diabetes care and management (Pansier and Schulz, 2015).

Educational programmes developed specifically for primary school teachers between 2013 and 2020 introduced eLearning or online training programmes due to their cost-

effectiveness. The interventions focused, among other things, on diabetes care and management, treatment of diabetic emergencies, and nutrition and diet in diabetes (Hatun and Özcan, 2013; Taha et al., 2018; Tournilhac, Dolladille, Armouche, Vial and Brouard, 2020).

Studies after the year 2000 centred mainly on programmes for school nurses in the management of diabetes, with very little research specifically on the training teachers of teachers in this field. Currently, no studies could be found in South Africa on training teachers on diabetes care and management in the school setting, and this is imperative as South African schools do not have school nurses who can be trained in this regard.

The objective of this study is to identify and collate pertinent information on training programmes that are available to equip teachers in the management of children's diabetes at school. The study will provide a comprehensive account of the methods used to train the teachers, as well as the content of the training programmes. The rapid review will thus guide researchers in the compilation of similar training programmes for South African teachers.

Theoretical Framework

Urie Bronfenbrenner's ecological systems theory explains how different types of environments influence child development. The model organises the environment into five systems the microsystem, the mesosystem, the exosystem, macrosystem, and the chronosystem (Bronfenbrenner, 1992). The microsystem is made up of those in the child's immediate environment like parents and schoolteachers. Their interaction with each other forms part of the mesosystem. Young children need help with the management of the disease both at home by their parents and in school by the teachers. The study is thus embedded in the effective interaction between the different systems bearing in mind, changes at one level has a reciprocal effect on other levels. A diabetes diagnosis, therefore, does not only affect the child and their family life but impacts their school life as well. For optimal development of the child, diabetes management must be effective in the mesosystem, which includes both the parents and the teachers of the child (Bronfenbrenner, 1992; Ettekal and Mahoney, 2017).

Methodology

Research Design

A rapid review approach was used to conduct this study. It can be described as an assessment of what is already known about a policy or practice issue (Grant and Booth, 2009). It is similar to a systematic review but differs in that time constraints govern it; however, it is rigorous in providing valid procedures to shorten timescales (Grant and Booth, 2009). The rapid review, therefore, provides a time-limited formal quality assessment adhering to the key principles of a systematic review which include maintaining transparency and avoiding bias. (Grant and Booth, 2009; Schünemann and Moja, 2015). The data collated from the chosen articles were used to answer the research question.

The Search Strategy

Databases and Keywords

The EBSCO Discovery Services (EDS) available from the North-West University library portal was utilised as the primary search engine as it provides access to numerous other data bases. The databases were searched using specific keyword formulations in all text, title, or abstract combinations.

Inclusion and Exclusion Criteria

Studies published from the year 2000 to 2019 were included as diabetes education programmes for teachers started gaining momentum only after the year 2000. Only studies with primary school teachers who educate children between the ages of six and thirteen years were included. This age group of children still requires assistance with their diabetes medication regimen as they are not yet autonomous (San Laureano et al., 2018).

Inclusion of studies was limited to full text, peer-reviewed studies published in English; qualitative, quantitative, and mixed-method studies; PhD theses, review studies, masters and mini-dissertations.

Non-peer-reviewed studies, conference proceedings, and studies published in any other language besides English where a translated version was not timeously available were excluded. The initial search yielded 269 articles after duplicates were removed.

Critical Appraisal

All three authors were involved in the quality appraisal process. The title and abstract of the articles identified by the keyword search were initially used to assess which studies may be included. The studies were then classified as relevant or irrelevant independently by each reviewer. The third reviewer was consulted when differences arose, and 63 potential articles were identified as relevant and chosen for quality appraisal after consensus between the reviewers was reached.

The 63 articles were then quality appraised independently by each reviewer using an appraisal instrument adapted from the Joanna Briggs Institute (2014) guidelines for qualitative and quantitative studies. The studies were carefully rated by each reviewer based on the following criteria, the clarity of the problem statement and research question, the validity of the study, the aims and the methodology, the accurate reporting of results and conclusions.

The highest-rated articles were then tabulated by each reviewer independently, and the results of the appraisal tables were compared with each other. No interrater differences were noted. After thorough and rigorous application of the exclusion and inclusion criteria, consideration of the quality of the research and the ability of the study to answer the research question a final list of eleven studies was then compiled to be included in the review.

[Insert figure 1. here]

Data Extraction

The process of data extraction began only after the articles were carefully appraised and selected. The review question informed the data chosen for extraction. The

following data were extracted from the selected studies. The title, authors and date of publication was chosen to assist in determining whether the article is relevant to answer the research question, the research design provided clarity on the method used to gather data and if it was reliable and valid. The content of the programme, method of implementation, and the conclusions and findings provided key information regarding the effectiveness of the training programmes.

[Insert Table 1. here]

Data Analysis and Synthesis

The thematic synthesis approach was used to inductively analyse the data extracted from the eleven retained studies (Thomas, O'Mara-Eves, Kneale and Shemilt, 2017). This method has clear guidelines, and the synthesis follows three rigorous phases a coding text phase, developing descriptive themes phase and generating analytical themes phase (Thomas and Harden, 2008).

To contribute to the accuracy of the study, the three reviewers read all the selected studies repeatedly to familiarise themselves with the content. The exploring, summarising, and synthesizing of themes was conducted independently by each reviewer. During the first phase, line by line coding allowed themes to be identified from the texts and linked together (Thomas et al., 2017). The themes were then grouped in a hierarchical structure and clustered into descriptive themes in the second phase (Thomas and Harden, 2008). Finally, in the last phase, analytical themes were established by formulating new explanations and conceptualisations that were able to answer the review questions (Thomas et al., 2017).

Ethical Issues

The rapid review study was conducted after being approved by the Community Psychosocial Research Scientific Committee (COMPRES), as well as having gained ethical clearance through the Health Research Ethics Committee (HREC) at the North-West University, Ethics number NWU-00940-19-A1, (Addendum A). The study does not involve any human participants, and thus the risk of harm is minimal. The study sought

to not only uphold scientific rigour in handling data but also in conveying the findings accurately and transparently (Gnyawali and Song, 2016).

Findings

Eleven studies met the inclusion criteria and addressed the aims of the study. More than half of the studies were based in developed countries such as Canada, France, and the United States of America whilst the rest of the studies drew their samples from developing countries such as India and Brazil, Kuwait, Portugal, Saudi Arabia, and Turkey. The eleven studies were predominantly quantitative, with one study being qualitative and one survey design study. The following themes emerged from the studies.

Training methods. Studies by Aljehany (2016); Dixe, Gordo, Catarino, Kraus and Menino (2020); Siminiero and Koerboel, (2000); Smith, Chen, Plake and Nash (2012), used face to face training methods while studies by Gutierrez (2020); Taha et al. (2018); Tournilhac et al. (2020) provided online training programmes. Radjenovic and Wallace (2001) provided computer-based training, and Husband, Pacaud, Grebenc and McKiel (2000), utilized a CD-ROM method while Chinnici, Middlehurst, Tandon, Arora, Belton, Franco, Bechara, Branco, Rawal, Shrivastav and Sung (2020), used paper-based training exclusively. The programme by Hatun and Özcan (2013), was a combination of online, paper-based and face to face training. The person to person training included lecture/workshop education sessions varying in length from 60 minutes to 3 hours per week (Aljehany, 2016; Dixe et al., 2020; Siminiero and Koerboel, 2000; Smith et al., 2012). The online programmes included a fully narrated and interactive programme with links to websites for diabetes resources, a ten-minute YouTube video link and an eLearning educational program with a skills workshop (Gutierrez, 2020; Taha et al., 2018; Tournilhac et al., 2020). The computer-based programme had video, and audio clips and the single paper-based training method included printed material on diabetes and a quick reference guide to deal with emergencies. The combination programme included posters, brochures, and presentations. (Chinnici et al., 2020; Hatun and Özcan, 2013; Husband et al., 2000; Radjenovic and Wallace, 2001).

Efficacy of programmes in terms of diabetes knowledge. Four of the intervention programmes that exclusively utilised face to face training approaches resulted in an increase in diabetes knowledge and/or care for students (Aljehany, 2016; Dixe et al., 2020; Siminiero and Koerboel, 2000; Smith et al., 2012;). The eLearning programme, electronic YouTube video training and the online training program also resulted in an improvement in teachers' diabetes knowledge (Gutierrez, 2020; Taha et al., 2018; Tournilhac et al., 2020). The study by Hatun and Özcan (2013), used a combination of face to face, online and printed material training methods, also reported an increase in diabetes knowledge. Both the eLearning and online programmes reported a statistically significant increase in diabetes knowledge (Gutierrez, 2020; Taha et al., 2018). Radjenovic and Wallace (2001), found that teachers retained more knowledge in the computer-based training than the paper-based equivalent.

In the studies that measured knowledge retention over time, the eLearning programme resulted in teachers retaining knowledge for six months up to twelve months without any support materials (Taha et al., 2018) while the person to person training programme designed, implemented and evaluated by Aljehany (2016), found that knowledge retention was the greatest three months after the intervention with levels still improving six months after the programme. The paper-based KiDS project not only reported an increase in teacher's knowledge regarding the nutritional requirements of children with diabetes but also a change in their own behaviour to take better care of their health. They became more confident and empathetic towards students with diabetes leading to a positive change in student-teacher relationships (Chinnici et al., 2020). No increase in teachers' knowledge was reported by the CD-ROM training tool (Husband et al., 2000). Therefore, ten of the studies were reported to be efficacious apart from the CD-ROM approach being ineffective as a standalone training method (Husband et al., 2000).

Teachers' confidence. An increase in teachers' confidence was found in the eLearning programme, the electronic YouTube video training, and the online training programme (Gutierrez, 2020; Taha et al., 2018; Tournilhac et al., 2020). The increase in confidence may assist school personnel in addressing the needs of children with diabetes during school hours (Smith et al., 2012). The paper-based KiDS project and two of the person to person training programmes also documented an increase in teachers' confidence

(Chinnici et al., 2020; Dixe et al., 2020; Smith et al., 2012). The face to face training method consisting of two three-hour sessions one week apart reported a statistically significant difference in teachers' confidence in supporting children with diabetes (Dixe et al., 2020). Therefore, all three different training methods, namely online, person to person and paper-based training increased teachers' confidence after the intervention.

Cost-effective methods. The online educational programme, the eLearning training and the computer-based training programmes all reported being cost-effective approaches (Radjenovic and Wallace, 2001; Taha et al., 2018; Gutierrez, 2020). Radjenovic and Wallace (2001) further found that the cost of the computer-based training was lower in the long term than the paper-based training due to less printed instruction material and cost-effective, easily updatable web-based computer programme. No materials are required to be printed or replaced and no travelling costs or substitute teacher fees. The face to face health education programme by Aljehany (2016) was also a cost-effective success due to its use of minimal resources.

Content of the training programmes. Most of the training programmes consisted of a combination of practical training methods and a theory-based element. The electronic video training comprised of a practical method only (Tournilhac et al., 2020), while the face to face health education program undertaken in Saudi Arabia and the national diabetes programme in Turkey concentrated on diabetes care and management at school (Aljehany, 2016; Chinnici et al., 2020). The following themes emerged regarding the content of the training programmes.

Information on diabetes. All four of the face to face studies highlighted the pathophysiology of diabetes including warning signs and symptoms of the disease and the causes classifications and complications of diabetes (Aljehany, 2016; Dixe et al., 2020; Siminiero and Koerboel, 2000; Smith et al., 2012). The KiDS paper-based project concentrated on diabetes prevention (Chinnici et al., 2020).

Diabetes care and management. Nine of the studies focused on day-to-day care and management of diabetes at school (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012) excluding the eLearning programme

and the electronic YouTube video training (Taha et al., 2018; Tournilhac et al., 2020). The importance of exercise and nutrition and a healthy lifestyle were among other key diabetes issues included in the training.

Diabetes emergencies. A key component of most of the training programmes was monitoring and dealing with diabetic emergencies, specifically hyper and hypoglycaemia. Topics included how to be prepared in evaluating and acting against these emergencies (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012; Taha et al., 2018)

Practical diabetes treatment methods. The online programmes included a demonstration on the administration of an insulin injection, how to administer a glucagon injection and the method of using a glucometer and a capillary glucose test (Gutierrez, 2020; Taha et al., 2018; Tournilhac et al., 2020).

Discussion

An increasing number of school-based training programmes have been implemented in developed and developing countries over the past twenty years due to the increase in prevalence of childhood diabetes (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Husband et al., 2000; Pansier and Schulz, 2015; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012; Taha et al., 2018; Tournilhac et al., 2020). The numerous interventions aimed specifically at training teachers were implemented in schools across the globe and varied in terms of duration, scope, method of training and measured outcomes (Pansier and Schulz, 2015).

All the studies sought to determine, in different ways if teachers' knowledge on diabetes had improved after the training (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Husband et al., 2000; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012; Taha et al., 2018; Tournilhac et al., 2020) with some studies measuring knowledge retention as well (Aljehany, 2016; Taha et al., 2018; Radjenovic and Wallace, 2001). In the studies using the different training methods such as person to person training, computer-based or

online training and paper-based methods, most of them found an increase in teachers' knowledge. However, it was only the online programmes that both recorded significant increases (Guitierrez, 2020; Taha et al., 2018). These results are consistent with literature which showed the effectiveness of a training video in improving teachers' knowledge (Henderson,1992). Furthermore, these programmes were reported as being cost-effective and easily accessible. It would appear, according to literature that while the online training resulted in significant increases in diabetes knowledge, the face to face training methods improved overall diabetes knowledge more than other educational methods in the study by Smith et al. (2012).

Furthermore, according to Radjenovic and Wallace (2001), the person to person training done by qualified health professionals was deemed superior to web-based training. Literature has found both methods to be efficacious. The impersonal CD-ROM approach resulted in an insignificant increase in knowledge on diabetes and these results concur with the findings of Gesteland, Sims and Lindsay (1989) regarding an impersonal approach to mass teaching of elementary school teachers. In conclusion, it appears that an interactive approach consisting of either a person to person or online programme or a combination of both will be effective in increasing teachers' knowledge of diabetes. Thus Husband et al. (2000) also recommended targeting school personnel with an interactive educational approach for diabetes to allow knowledge to be reinforced well. Furthermore, Dixe et al. (2020), found that active methodologies with participation in drills and case discussions by school personnel will enhance diabetes knowledge.

Effective training programmes included both information on diabetes pathology and practical demonstration on insulin administration and glucose monitoring. Most of the training covered topics regarding diabetes care and management at school and preparedness for diabetes emergencies (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Husband et al., 2000; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012; Taha et al., 2018). The findings of the rapid review suggest that the interactive training program must consist of both a theory-based element covering basic knowledge on diabetes, its symptoms, day-to-day care regarding glucose monitoring, nutrition, and exercise and

how to monitor, assess and react appropriately to diabetes emergencies such as hyper and hypoglycaemia. A practical training session should be included that covers a hands-on or video demonstration on how to use a glucometer and inject insulin and glucagon. Research concurs that training teachers on the symptoms of hyperglycaemia, assessing and proper assistance of hypoglycaemia, insulin regimens and a practical workshop are the most important goals for diabetes management at schools (Siminerio and Koebel, 2000; Taha et al., 2018).

Studies that measured teachers' confidence reported increases across the different methods of training including person to person, electronic, online and paper-based training (Aljehany, 2016; Chinnici et al., 2020; Dixe et al., 2020; Gutierrez, 2020; Hatun and Özcan 2013; Radjenovic and Wallace, 2001; Siminiero and Koerboel, 2000; Smith et al., 2012; Taha et al., 2018; Tournilhac et al., 2020).

Although online training methods are cost-effective and have shown improvement in diabetes knowledge and increase in confidence, Guterrez (2020), found that this method was not preferred by everyone and resulted in a weak relationship between confidence and usefulness of the program. The review found that as teachers' knowledge of diabetes increased, they were more ready to assist students with diabetes care and management at school. Husband et al. (2000), Smith et al. (2012), Chinicci et al. (2020) also found that education regarding diabetes improved teachers' confidence in responding to the diabetes needs of students in school. Additionally, increasing teachers' knowledge on diabetes-related emergencies empowered them to manage these situations with confidence during school time (Smith et al., 2012); however, if they have inadequate knowledge on diabetes, this may result in them helping students incorrectly (Husband et al., 2000).

In conclusion, guidelines concerning the development of a training programme can be recommended by this rapid review study. An interactive person to person education training program with an online interactive eLearning component will be effective in increasing teachers' knowledge and confidence in diabetes management and care. The programme target audience should include teachers and all school personnel that come into regular contact with learners. The structured programme should include a theory

and a practical section covering the basic pathophysiology about diabetes including signs and symptoms for early detection, day-to-day diabetes care and management in the school setting such as nutritional requirements and exercise, handling of diabetic emergencies including hyper and hypoglycaemia. The practical presentation should consist of the procedure of administering and monitoring insulin and glucagon using glucometers and different insulin regimens such as injections, pens, and pumps. The person to person programme should last 60 minutes to three hours, including an interactive lecture format comprising of case discussions. A website link to the face to face session should be available online together with a shorter practical demonstration on insulin regimens to be accessed whenever the teachers require.

Although the review points in the direction of a face to face and an online programme in the South African context, this proves difficult due to our limited resources and underdeveloped infrastructure. The training programmes will differ depending on the situation of the school and the facilities it has in place. Many rural schools still do not have computers and access to the internet; thus, an online training program will prove to be ineffective for these teachers. In this regard, the recommendations for a training programme for teachers in South African rural schools should exclusively utilise person to person workshops whereby trained health professionals travel to schools in remote areas and present education sessions on the theory of diabetes as well as hands-on demonstrations of glucose monitoring and insulin injections. For more developed schools in the urban areas and for teachers who have access to the internet, a combination approach, as suggested above, may be implemented.

Limitations

Only eleven articles on diabetes education programmes were included in the review that met the inclusion criteria with no South African study among them. The findings of the studies in more developed countries may prove challenging to replicate to the South African context due to its limited resources. The samples of the teachers and the number of schools utilized were limited in most cases, making it difficult to generalize the results. The studies measured different parameters using different measurement

tools, and therefore no single value can be used to demonstrate the effectiveness of the training programmes.

Recommendations

This study has highlighted the need for further comprehensive research to evaluate training methods for teachers to manage children's diabetes at school. Although the review found that the increase in teachers' knowledge of diabetes was significant in online studies, further comparative studies are required to measure the effectiveness of other training methods with this method. Further studies evaluating the effectiveness of a combination of training methods may be useful. The review, therefore, does not provide definitive guidelines on the most effective educational programme, but it provides evidence for the development of future diabetes training programmes for teachers. It may be beneficial to note that in the unique South African context, the marked discrepancies in school infrastructure between rural and urban school should be carefully considered when developing a training programme. A 'one size fits all' approach will not be effective in our local schools and the programme will have to be tailored to the facilities available per school. Research should also be undertaken in more African countries to ensure that children with diabetes have equal opportunities as other children all over the world.

Tables and Figures

Figure 1. The search, relevance, and quality appraisal process

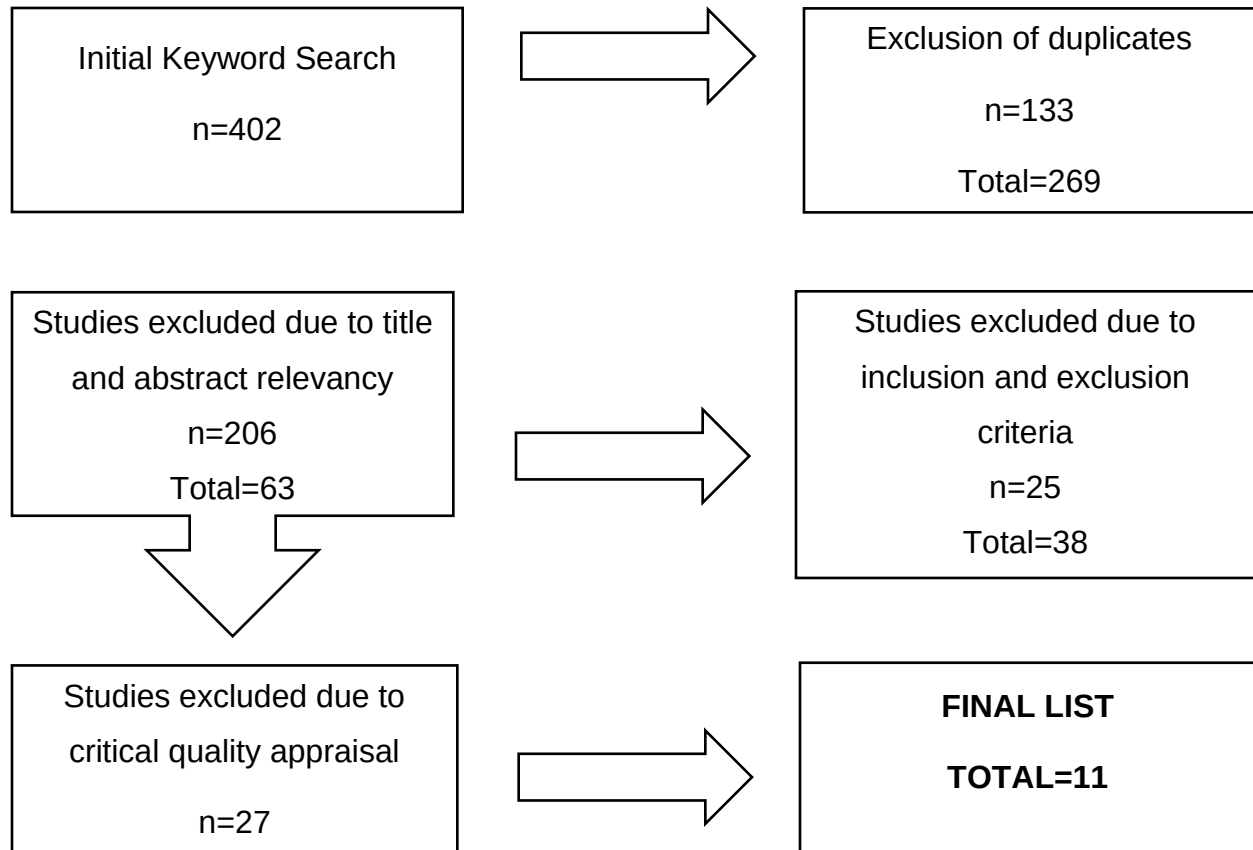


Table 1. Data Extraction Table

No.	Title of Article	Author and Publication date	Methodology	Participants	Contents of the Program	Method of Training	Core Findings
1	A diabetes education program for school personnel	Siminerio and Koebel, 2000	Quantitative	156 school personnel.	Causes. Classification, complications, care, and cure of diabetes.	Face to face. Lecture format lasting 1-1.5 hrs. 5C'S OF DIABETES	1. Method very efficacious. 2. Significant increase in knowledge.
2	The effectiveness of a CD-ROM in educating teachers who have a student with diabetes	Husband Pacaud, Grebenc and McKiel 2000	Quantitative	Teachers	CD-ROM included basic diabetes information on pathophysiology and treatment of type 1 diabetes, how to handle day-to-day concerns, dealing with mild to severe hypoglycaemia.	CD-ROM TYPE 1 DIABETES: A PASSPORT TO KNOWLEDGE	1. Did not significantly increase teachers' knowledge. 2. Quality of educational tool responsible for insignificant gain in knowledge. 3. May be used in conjunctions with other training methods to be more effective.
3	Computer-based remote diabetes education for school personnel	Radjenovic and Wallace 2001	Quantitative	Elementary education teachers.	Video clips demonstrating an injection and nutrition. Audio clips included children talking about food, exercise, and feelings associated with low blood sugar. Paper-based training based on the same.	Computer-based training program, including audio and visual clips. Paper-based training on the same topic. HTML COMPUTER TRAINING MODULE	1. Greater satisfaction with the computer-based education program. 2. Teachers retained more knowledge in the computer-based training. 3. Cost-effective method. 4. Person to person training superior to both computer-based training and paper training.
4	Evaluation of the impact of a diabetes education eLearning program for school personnel on diabetes knowledge, knowledge retention and confidence in caring for students with diabetes	Taha, Rahme, Mesbah, Mahmoud, AlKandari, Othman, Sharaikha, Lari, AlBeloushi, Saad and Arefanian 2018	Quantitative	Public schools' personnel	eLearning program includes four modules (i) diabetes basics (ii) hypoglycaemia, (iii)hyperglycaemia (iv) ketones Each including a practical component using a glucometer, an injection and measuring ketones.	eLearning educational program and a skills workshop.	1, Diabetes knowledge increased significantly. 2. Knowledge retention six months up to 12 months no support materials. 3. Increased teachers' confidence. 4. Cost-effective approach.
5	Effects of an education program on knowledge and self-perception of school personnel in preparing to care for type 1 diabetes students	Dixe, Gordo, Catarino, Kraus and Menino 2020	Quantitative	School staff	Each session included a theory-based and a practical-based section.	Face to face education program. Two sessions are lasting 6 hours, one week apart. DARE + PROGRAMME	1. Improvement of diabetes knowledge. 2. Increase in teachers' confidence. 3. Programme enhanced self-perception of school personnel.

No.	Title of Article	Author and Publication date	Methodology	Participants	Contents of the Program	Method of Training	Core Findings
6	Evaluation of the Impact of a Diabetes Education Curriculum for School Personnel on Disease Knowledge and Confidence in Caring for Students	Smith, Chen, Plake and Nash 2012	Quantitative	44 school personnel	1. Overview of diabetes pathology 2. monitoring and treating diabetes and hypoglycaemia, 3. dietary considerations 4. exercise and blood glucose	Face to face 60 min education session.	1. Increased confidence and knowledge. 2. Better results in overall diabetes knowledge than other studies using different educational methods such as CD-ROM, pamphlets, and video tutorials.
7	Improving the care of students with diabetes in rural schools utilizing an online diabetes education program for school personnel	Gutierrez 2020	Quantitative	132 school personnel.	1. Blood glucose monitoring 2. Recognizing and treating hypoglycaemia and hyperglycaemia 3. Insulin and insulin regimens 4. Insulin delivery services 5. Diet and Nutrition 6. Exercise and physical activity 7. Disaster preparedness	A fully narrated and interactive e-learning program including diabetes skills training videos; links to diabetes-related web resources; samples of a diabetes medical management plan, individual health plan, emergency information sheet. DIABETES CARE AT SCHOOL: BRIDGING THE GAP	1. Significant increase in knowledge and confidence. 2. Easily accessible. 3. Can be completed at individuals own pace. 4. Cost effective and saves travel time but computer and computer skills pre-requisite. 5. Online training not preferred by everyone weak relationship between confidence and usefulness of program.
8	Improving the school experience of children with diabetes: Evaluation of the KiDS project	Chinnici, Middlehurst, Tandon, Arora, Belton, Franco, Bechara, Branco, Rawal, Shrivastav and Sung 2020	Qualitative	Teachers in India and Brazil.	Material on diabetes prevention, diabetes management, tips for leading a healthy lifestyle. Quick reference sections on dealing with hyper- and hypoglycaemia.	Printed material in an education pack. KiDS PROJECT TRAINING PROGRAMME	1. School staff felt confident to manage children with diabetes. 2. Teachers changed their own behaviour to minimize risk of diabetes. 3. Positive change in student-teacher relationships. 4. School staff increased knowledge of nutrition. 6. Knowledge on treating children with diabetes the same as other children increased. 5. High level of satisfaction with the clarity and accessibility of information.

No.	Title of Article	Author and Publication date	Methodology	Participants	Contents of the Program	Method of Training	Core Findings
9	Evaluation of a new training program to reassure primary school teachers about glucagon injection in children with type 1 diabetes during the 2017–2018 school year	Tournilhac, Dolladille, Armouche, Vial, and Brouard 2020	Quantitative	All primary school teachers Normandy	10 min electronic video showing the administration of a capillary glucose test, glucagon injection, insulin injection.	Electronic video training link accessible via YouTube.	1. Improved self-confidence of teachers 2. Improved teachers diabetes knowledge. 3. Reassured teachers about administering glucagon injection 4. Short and convenient.
10	The impact of a health education programme on primary school teacher's knowledge and attitudes towards type 1 diabetes mellitus in children in Saudi Arabia	Aljehany 2016	Quantitative	Teachers	The program included warning signs, symptoms, treatment of diabetes in school. Interactive learning activities and open discussions.	3-hour health education program per day per school. HEALTH EDUCATION PROGRAMME	1. Increase in knowledge and attitude 2. Intervention effective over a period. 3. Teachers had greatest retention three months after intervention; knowledge improved six months after programme. 4. Content and structure of programme very effective. 5. Cost-effective due to minimal resources.
11.	National programme in Turkey: Diabetes at school	Hatun and Özcan 2013	Survey	All professional teachers across Turkey	Four short films -diabetes care management, prevention of childhood obesity, children living with diabetes. A website -education materials. Poster campaign/brochures a guide and presentation for teachers.	Short online films and website-resources on diabetes. Face to face School training sessions. Posters and brochures.	1. Teachers satisfied with the program. 2. Knowledge of diabetes increased.

References

- Abraham MB, Jones TW, Naranjo D, Karges B, Oduwole A, Tauschmann M & Maahs, DM 2018. ISPAD Clinical Practice Consensus Guidelines 2018: Assessment and management of hypoglycemia in children and adolescents with diabetes. *Pediatric Diabetes*, 19:178-192. <https://doi.org/10.1111/pedi.12698>
- Aljehany BM 2016. The impacts of a health education programme on primary school teachers' knowledge and attitudes towards Type 1 diabetes mellitus in children in Saudi Arabia. Doctoral dissertation. Manchester, United Kingdom: University of Salford.
- Aycaan Z, Önder A, Çetinkaya S, Bilgili H, Yıldırım N, Baş VN, Kendirci HNP & Ağladioğlu, SY 2012. Assessment of the knowledge of diabetes mellitus among school teachers within the scope of the managing diabetes at school program. *Journal of Endocrinology and Metabolism*, 4(4):199-203. <https://doi.org/10.4274/jcrpe.756>
- Boden S, Lloyd CE, Gosden C, Macdougall C, Brown N & Matyka K 2012. The concerns of school staff in caring for children with diabetes in primary school. *Pediatric Diabetes*, 13(6):e6-e13. <https://doi.org/10.1111/j.1399-5448.2011.00780.x>
- Bratina N, Forsander G, Annan F, Wysocki T, Pierce J, Calliari LE, Pacaud D, Adolfsson P, Dovč K, Middlehurst A & Goss P 2018. ISPAD Clinical Practice Consensus Guidelines: Management and support of children and adolescents with type 1 diabetes in school. *Pediatric Diabetes*, 19(S17):S287-S301. <https://doi.org/10.1111/pedi.12743>
- Bronfenbrenner U 1992. *Ecological systems theory*. London, England: Jessica Kingsley Publishers.
- Chinnici D, Middlehurst A, Tandon N, Arora M, Belton A, Franco DR, Bechara GM, Branco FC, Rawal T, Shrivastav R & Sung E 2019. Improving the school experience of children with diabetes: Evaluation of the KiDS project. *Journal of Clinical & Translational Endocrinology*, 15:70-75. <https://doi.org/10.1016/j.jcte.2018.12.001>
- Delamater AM, de Wit M, McDarby V, Malik JA, Hilliard ME, Northam E & Acerini CL, 2018. ISPAD Clinical Practice Consensus Guidelines 2018: Psychological care of

children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(S27):S237-S249. <https://doi.org/10.1111/pedi.12736>

Dixe MDACR, Gordo CMGDO, Catarino HBP, Kraus T & Menino EPDSG 2020. Effects of an education program on knowledge and self-perception of school personnel in preparing to care for type 1 diabetes students. *Einstein (São Paulo)*, 18. http://dx.doi.org/10.31744/einstein_journal/2020ao5101

Driscoll KA, Volkening LK, Haro H, Ocean G, Wang Y, Jackson CC, Clougherty M, Hale DE, Klingensmith GJ, Laffel L & Deeb LC 2015. Are children with type 1 diabetes safe at school? Examining parent perceptions. *Pediatric Diabetes*, 16(8):613-620. <https://doi.org/10.1111/pedi.12204>

Ettekal AV & Mahoney JL 2017. Ecological systems theory. In K Peppler (ed). *The Sage encyclopedia of out-of-school learning*. London, England: Sage. <https://doi.org/10.4135/9781483385198.n94>

Gesteland HM, Sims S & Lindsay RN 1989. Evaluation of two approaches to educating elementary schoolteachers about insulin-dependent diabetes mellitus. *The Diabetes Educator*, 15(6):510-513. <https://doi.org/10.1177/014572178901500607>

Gnyawali DR & Song Y 2016. Pursuit of rigor in research: Illustration from coopetition literature. *Industrial Marketing Management*, 57:12-22. <https://doi.org/10.1016/j.indmarman.2016.05.004>

Grant MJ & Booth A 2009. A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal*, 26(2):91-108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>

Gutierrez C, 2020. Improving the care of students with diabetes in rural schools utilizing an online diabetes education program for school personnel. *Rural and Remote Health*, 20(1):5596-5596. <https://doi.org/10.22605/rrh5596>

Gutiérrez-Manzanedo JV, Carral-San Laureano F, Moreno-Vides P, de Castro-Maqueda, G, Fernández-Santos JR & Ponce-González JG 2018. Teachers' knowledge about Type 1 diabetes in south of Spain public schools. *Diabetes Research and Clinical Practice*, 143:140-145. <https://doi.org/10.1016/j.diabres.2018.07.013>

Hatun S & Özcan S 2013. National programme in Turkey: Diabetes at school. *Diabetes Voice*, 58(1):21-23.

Henderson JM 1992. Teacher training and children with Type 1 diabetes. *Diabetic Medicine*, 9(7):674-676. <https://doi.org/10.1111/j.1464-5491.1992.tb01867.x>

Husband A, Pacaud D, Grebenc K & McKiel E 2000. The effectiveness of a CD-ROM in educating teachers who have a student with diabetes. *Diabetes Research and Clinical Practice*, 50(S1):S416. [https://doi.org/10.1016/S0168-8227\(00\)81416-3](https://doi.org/10.1016/S0168-8227(00)81416-3)

International Diabetes Federation 2019. *IDF Diabetes Atlas* (9th ed). Available at <https://www.diabetesatlas.org/en/resources/>. Accessed 7 March 2020.

Ješić MD, Milenković T, Mitrović K, Todorović S, Zdravković V, Ješić MM, Bošnjović-Tucaković T, Marković S, Vorgučin I, Stanković S & Sajić S 2016. Problems in diabetes management in school setting in children and adolescents with Type 1 diabetes in Serbia. *Vojnosanitetski pregled*, 73(3):273-276. <https://doi.org/10.2298/VSP150203007J>

Joanna Briggs Institute 2014. *Joanna Briggs Institute reviewers' manual 2014*. <https://nursing.lsuhs.edu/JBI/docs/ReviewersManuals/Economic.pdf>

Kalweit KL, Briers N & Olorunju SA 2015. The success of various management techniques used in South African children with type 1 diabetes mellitus. *South African Medical Journal*, 105(5):400-404.
<https://www.ajol.info/index.php/samj/article/view/126949>

Kaufman FR, Gallivan JM & Warren-Boulton E 2009. Overview of diabetes in children and teens. *American Journal of Health Education*, 40(5):259-263.
<https://doi.org/10.1080/19325037.2009.11770768>

Lindsay R, Jarrett L & Hilliam K 1987. Elementary schoolteachers' understanding of diabetes. *The Diabetes Educator*, 13(3):312-314.
<https://doi.org/10.1177/014572178701300315>

Maleki MM, Talakoub S & Abazari P 2016. Investigating the effect of teacher training program on understanding teachers' supportive behaviors by students with diabetes. *International Journal of Medical Research & Health Sciences*, 5(12):186-190.

- Marks A, Wilson V & Crisp J 2013. The management of type 1 diabetes in primary school: Review of the literature. *Issues in Comprehensive Pediatric Nursing*, 36(1-2):98-119. <https://doi.org/10.3109/01460862.2013/782079>
- Nuche-Berenguer B & Kupfer LE 2018. Readiness of sub-Saharan Africa healthcare systems for the new pandemic, diabetes: A systematic review. *Journal of Diabetes Research*, 2018. <https://doi.org/10.1155/2018/926239>
- Pansier B & Schulz PJ 2015. School-based diabetes interventions and their outcomes: A systematic literature review. *Journal of Public Health Research*, 4(1):467. <https://doi.org/10.4081/jphr.2015.467>
- Pinelli L, Zaffani S, Cappa M, Carboniero V, Cerutti F, Cherubini V, Chiarelli F, Colombini MI, La Loggia A, Pisanti P & Vanelli M 2011. The ALBA project: An evaluation of needs, management, fears of Italian young patients with type 1 diabetes in a school setting and an evaluation of parents' and teachers' perceptions. *Pediatric Diabetes*, 12(5):485-493. <https://doi.org/10.1111/j.1399-5448.2010.00722.x>
- Radjenovic D and Wallace FL 2001. Computer-based remote diabetes education for school personnel. *Diabetes Technology & Therapeutics*, 3(4):601-607. <https://doi.org/10.1089/15209150152811225>
- San Laureano FC, Manzanedo JVG, Vides PM, de Castro Maqueda G, Santos JRF González JGP & Ortega MDCA 2018. Teachers' attitudes and perceptions about preparation of public schools to assist students with Type 1 diabetes. *Endocrinología, Diabetes y Nutrición*, 65(4):213-219. <https://doi.org/10.1016/j.endien.2018.04.003>
- Schünemann H & Moja L 2015. Reviews: Rapid! Rapid! Rapid! ... and systematic. *Systematic Reviews*, 4(1):4. <https://doi.org/10.1186/2046-4053-4-4>
- Siminerio LM & Koerbel G 2000. A diabetes education program for school personnel. *Practical Diabetes International*, 17(6):174-177. [https://doi.org/10.1002/1528-252X\(200009\)17:6<174:AID-PDI105>3.0.CO;2-4](https://doi.org/10.1002/1528-252X(200009)17:6<174:AID-PDI105>3.0.CO;2-4)
- Smith CT, Chen AM, Plake KS & Nash CL 2012. Evaluation of the impact of a diabetes education curriculum for school personnel on disease knowledge and confidence in

caring for students. *Journal of School Health*, 82(10):449-456.

<https://doi.org/10.1111/j.1746-1561.2012.00721.x>

Schwartz FL, Denham S, Heh V, Wapner A & Shubrook J. 2010. Experiences of children and adolescents with Type 1 diabetes in school: Survey of children, parents, and schools. *Diabetes Spectrum*, 23(1):47-55. <https://doi.org/10.2337/diaspect.23.1.47>

Taha NA, Rahme Z, Mesbah N, Mahmoud F, AlKandari S, Othman N, Sharaikha H, Lari BS, AlBeloushi S, Saad E & Arefanian, H 2018. Evaluation of the impact of a diabetes education eLearning program for school personnel on diabetes knowledge, knowledge retention and confidence in caring for students with diabetes. *Diabetes Research and Clinical Practice*, 139:348-356. <https://doi.org/10.1016/j.diabres.2018.03.019>

Thomas J & Harden A 2008. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8:45.

<https://doi.org/10.1186/1471-2288-8-45>

Thomas J, O'Mara-Eves AJ, Harden A & Newman M 2017. Synthesis methods for combining and configuring textual or mixed methods data. In D Gough, S Oliver & J Thomas (eds). *An introduction to systematic reviews*. London, England: Sage.

Tolbert R 2009. Managing type 1 diabetes at school: An integrative review. *The Journal of School Nursing*, 25(1):55-61. <https://doi.org/10.1177/1059840508329295>

Tournilhac C, Dolladille C, Armouche S, Vial S & Brouard J 2020. Evaluation of a new training program to reassure primary school teachers about glucagon injection in children with Type 1 diabetes during the 2017–2018 school year. *Archives de Pédiatrie*, 27(4):212-218. <https://doi.org/10.1016/j.arcped.2020.02.002>

Wolfsdorf JI, Glaser N, Agus M, Fritsch M, Hanas R, Rewers A, Sperling MA & Codner E 2018. ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatric Diabetes*, 19(S27):S155-S177.

<https://doi.org/10.1111/pedi.12701>

Ziegler R & Neu A 2018. Diabetes in childhood and adolescence: A guideline-based approach to diagnosis, treatment, and follow-up. *Deutsches Ärzteblatt International*, 115(9):146-156. <https://doi.org/10.3238/arztebl.2018.0146>

Section 3: Critical Self-Reflection

3.1 Introduction

The scope of the current study is embedded in the discipline of social sciences. Social science research objectives are to understand unexplained phenomena of human contact and behaviour by exploring, conceptualizing, and analysing human nature (Packer, 2018; Weber, 2017). The contribution of the current study to the realm of social sciences can be authenticated through a critical reflection of the core components of the study. Section 3 of the mini-dissertation will provide a concise overview of the conception and aim of the study concluding with the epilogue on the research process focusing on the findings, limitations, recommendations, significance of the study and a personal reflection.

3.2 Conception of the Study

Essentially, to contribute meaningfully to the field of social science and increase the present scientific understanding, an idiosyncratic, socially significant topic had to be identified to be further explored. Diabetes is a chronic disease that is on the increase in all age groups, including school-going children. (IDF, 2019). Children spend a significant part of their day at school and depending on their age group will require assistance with their diabetes management regime (Pansier & Schulz., 2015; Bratina et al., 2018). The incorrect management of diabetes becomes problematic from a social perspective as it leads to health complications, psychological challenges, and poor quality of life for students not being adequately assisted at school (Bratina et al., 2018; Delamater et al., 2018; Wolfsdorf et al., 2018). Parents and teachers themselves feel that they do not have enough knowledge on diabetes and diabetes emergencies to be able to

manage the disease during school hours effectively (Boden et al., 2012; Ješić et al., 2016). This incurable disease requires adequate management at home and the school setting to be successful (Ješić et al., 2016). Thus, the following research question arose: What are the training programmes available nationally and internationally to equip teachers to manage children's diabetes at school?

3.3 Research Aim

The study aimed to distinguish and classify significant information on training programmes that are available to train teachers in the management of children's diabetes at school.

3.4 Epilogue

3.4.1 Research Process

A rapid review study approach was employed as it uses a systematic review approach with shortened timescales to provide an assessment of what is already known about a practice issue (Grant & Booth, 2009). The theoretical framework was grounded in Urie Bronfenbrenner's ecological theory (Bronfenbrenner, 1992). A thorough literature search using the North-West University database, the EBSCO discovery services portal was conducted to identify literature about the research topic. The retrieved studies were then screened for relevance based on the inclusion and exclusion criteria. The retained studies were then systematically critically appraised using a quality appraisal tool. Eleven articles published from the year 2000 to 2020 were chosen to be part of the review.

Pertinent data were extracted from the studies and tabulated. The thematic synthesis approach outlined by Thomas et al. (2017) was used to analyse the data extracted from the articles. The common themes across the studies were coded, grouped into descriptive themes, and then analytical themes in three rigorous phases.

3.4.2 Findings

The studies used different methods of training, and most of them were found to be efficacious, in that they increased teachers' knowledge, except one. Some of the common themes highlighted were the teacher's confidence, the cost-effectiveness and content of the educational programmes. Four of the face to face training programmes resulted in an improvement of teachers' knowledge and the three web-based interventions also reported similar findings. Notably, two of the studies found a statistically significant increase in knowledge. A paper-based programme and intervention using a combination of training via face to face, printed material and online methods resulted in teachers' knowledge increasing after the intervention too. The CD-ROM training intervention was not efficacious and did not increase teachers' knowledge.

Teachers' confidence increased in two of the person-to-person-educational programmes and the paper-based training approach. Similarly, all the online educational programmes and the paper-based method increased teacher's confidence to care for children with diabetes at school.

A few studies were identified as being cost-effective, the online training programmes and one of the face-to-face health programmes due to its use of minimal resources.

An interactive online and face to face training programme was identified as being most effective. This type of programme would be difficult to implement in South Africa due to it being a developing country.

3.4.3 Limitations

Some limitations of the study are worth mentioning despite the current study achieving its aims

- A limited number of studies were available for review with no South African study amongst them emphasising the lack of research in the local context and the significance of the need for further research in this field.
- The sample of teachers was limited and restricted to only a small number of schools which makes it difficult to generalise the results further emphasising the limited research available.
- No single value of effectiveness could be determined from the research due to the studies measuring different parameters with different measurement tools.

3.4.4 Recommendations

The current study emphasizes the need for further thorough research on training programmes for teachers on diabetes in school. The following can be recommended: -

- Comparative studies on the effectiveness of online programmes versus other methods of training to establish the reasons for its efficacy.
- Further research on methods of training combining two or more approaches and evaluating the effectiveness of this approach.
- Research on a standardised method to measure the effectiveness of training programmes with a comparative single value to allow different programmes to be compared efficiently.

- Research conducted in Africa regarding diabetes training programmes to allow generalisability to the South African context.
- Guidelines on the development of a training programme suited to the South African context.

3.4.5 Significance of the Study

- The current review study aims to add to the limited amount of research available on the training programmes for teachers to manage children's diabetes at school. There are a few international sources of literature available on this topic and no South African studies available currently. This study is one of the first studies on this topic currently undertaken locally. It serves to stress the importance of developing a training programme to assist teachers in managing diabetes at school.
- The current study highlights the importance of training teachers on diabetes to assist children in improving their physical, psychological, and social well-being. It emphasises the crucial role South African teachers can play to assist children with management and care of this disease due to its discrepancies in the public health care services.
- The findings of the study proved to be useful in providing guidelines with regards to method and content, for the development and implementation of future training programmes for teachers in South African schools.

3.5 Personal Reflection of the Researcher

The research process proved very daunting and overwhelming initially, particularly as I was unfamiliar with the research methodology of a rapid review. After overcoming the initial hurdle

by reading numerous articles on rapid reviews and gaining information from knowledgeable colleagues, the greatest challenge was to continue with my dissertation while adjusting to my internship at the South African Military Health Services. As I began easing into the new routine and the client load began increasing, I became concerned about not being able to meet the demands of my internship and having enough time and energy to work on my review study. I struggled with consistency and worked on it intermittently. I was certainly not prepared for what occurred next and the repercussions it would have for my internship and my research. At the end of March 2020, the country went into an unprecedented lockdown; this changed the way we worked and lived overnight. Fortunately, I was still able to go to work and see clients intermittently with the necessary protocols in place. I found a lack of energy and little time for myself, let alone any to continue my research. After a few weeks and gradually settling into a new normal, the days became more manageable. I struggled to be motivated to work on my research regularly and consistently, but when I began, I found the topic riveting and my curiosity growing the more I read. My journey to complete my mini-dissertation has been challenging and a roller coaster of emotions. It tested my capabilities as a researcher and showed me a determination I did not know I possessed to complete it. This process was undoubtedly made manageable by the unwavering support, encouragement and guidance of my supervisor who stood by my side and believed in me even through a global pandemic.

Reflecting on my journey as a researcher I am grateful for the experience in the current year as it was an opportunity for personal growth and resilience, learning to adapt to different ways of doing things to achieve my goals. The study challenged me in unique ways, but it was a priceless learning experience, and I will certainly use my new found skills to pursue a PhD in the future.

Although the study is based on a small number of articles, it still has value in reviewing the different educational programmes, their training methods, and their effectiveness. It will be beneficial to the development of such programmes aimed at the South African school context, facilitate a step closer in granting equal opportunities to children with diabetes, and create an opportunity for them to enjoy their school years as all children should.

“There can be no keener revelation of a society’s soul than the way in which it treats its children.”

~ Nelson Mandela

3.6 References

- Boden, S., Lloyd, C. E., Gosden, C., Macdougall, C., Brown, N., & Matyka, K. (2012). The concerns of school staff in caring for children with diabetes in primary school. *Pediatric Diabetes*, 13(6), e6-e13. <https://doi.org/10.1111/j.1399-5448.2011.00780.x>
- Bratina, N., Forsander, G., Annan, F., Wysocki, T., Pierce, J., Calliari, L. E., Pacaud, D., Adolfsson, P., Dovč, K., Middlehurst, A., & Goss, P. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Management and support of children and adolescents with type 1 diabetes in school. *Pediatric Diabetes*, 19(17, Suppl.), S287–S301. <https://doi.org/10.1111/pedi.12743>
- Bronfenbrenner, U. (1992). *Ecological systems theory*. Jessica Kingsley Publishers.
- Delamater, A. M., de Wit, M., McDarby, V., Malik, J. A., Hilliard, M. E., Northam, E., & Acerini, C. L. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: psychological care of children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S237–S249. <https://doi.org/10.1111/pedi.12736>
- Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91–108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>
- International Diabetes Federation. (2019). *IDF Diabetes Atlas* (9th ed.). <https://www.diabetesatlas.org/en/resources/>
- Ješić, M. D., Milenković, T., Mitrović, K., Todorović, S., Zdravković, V., Ješić, M. M., Bošnjović-Tucaković, T., Marković, S., Vorgučin, I., Stanković, S., & Sajić, S. (2016). Problems in diabetes management in school setting in children and adolescents with Type 1

diabetes in Serbia. *Vojnosanitetski pregled*, 73(3), 273–276.

<https://doi.org/10.2298/VSP150203007J>

Pansier, B., & Schulz, P. J. (2015). School-based diabetes interventions and their outcomes: A systematic literature review. *Journal of Public Health Research*, 4(1), 467.

<https://doi.org/10.4081/jphr.2015.467>

Packer, M. J. (2018). *The science of qualitative research* (2nd ed.). Cambridge University Press.

Thomas, J., O'Mara-Eves, A., Kneale, D., & Shemilt, I. (2017). Synthesis methods for combining and configuring textual or mixed methods data. In D. Gough, S. Oliver & J. Thomas (Eds.), *An introduction to systematic reviews* (pp. 182–209). Sage.

Weber, M. (2017). *Methodology of social sciences*. Routledge.

Wolfsdorf, J. I., Glaser, N., Agus, M., Fritsch, M., Hanas, R., Rewers, A., Sperling, M. A., & Codner, E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatric Diabetes*, 19(27, Suppl.), S155–S177. <https://doi.org/10.1111/pedi.12701>

Complete References

- Abraham, M. B., Jones, T. W., Naranjo, D., Karges, B., Oduwole, A., Tauschmann, M., & Maahs, D. M. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Assessment and management of hypoglycemia in children and adolescents with diabetes. *Pediatric Diabetes*, 19, 178–192. <https://doi.org/10.1111/pedi.12698>
- Adolfsson, P., Riddell, M. C., Taplin, C. E., Davis, E. A., Fournier, P. A., Annan, F., Scaramuzza, A. E., Hasnani, D., & Hofer, S. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Exercise in children and adolescents with diabetes. *Pediatric Diabetes*, 19, 205–226. <https://doi.org/10.1111/pedi.12755>
- Aljehany, B. M. (2016). *The impacts of a health education programme on primary school teachers' knowledge and attitudes towards Type 1 diabetes mellitus in children in Saudi Arabia* [Doctoral dissertation, University of Salford]. University of Salford Institutional Repository. <http://usir.salford.ac.uk/id/eprint/39345/7/B%20Thesis.pdf>
- American Diabetes Association. (2013). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, 36(1, Suppl.), S67–S74.
- Aycan, Z., Önder, A., Çetinkaya, S., Bilgili, H., Yıldırım, N., Baş, V. N., Kendirci, H. N. P., & Ağladioğlu, S. Y. (2012). Assessment of the knowledge of diabetes mellitus among schoolteachers within the scope of the managing diabetes at school program. *Journal of Endocrinology and Metabolism*, 4(4), 199–203. <https://doi.org/10.4274/jcrpe.756>

- Bambra, C. (2011). Real world reviews: A beginner's guide to undertaking systematic reviews of public health policy interventions. *Journal of Epidemiology and Community Health*, 65(1), 14–19. <https://doi.org/10.1136/jech.2009.088740>
- Bobo, N., Wyckoff, L., Patrick, K., White, C., Glass, S., Carlson, J. P., & Perreault, C. (2011). A collaborative approach to diabetes management: The choice made for Colorado schools. *The Journal of School Nursing*, 27(4), 269–281. <https://doi.org/10.1177/1059840511408323>
- Boden, S., Lloyd, C. E., Gosden, C., Macdougall, C., Brown, N., & Matyka, K. (2012). The concerns of school staff in caring for children with diabetes in primary school. *Pediatric Diabetes*, 13(6), e6–e13. <https://doi.org/10.1111/j.1399-5448.2011.00780.x>
- Bratina, N., Forsander, G., Annan, F., Wysocki, T., Pierce, J., Calliari, L. E., Pacaud, D., Adolfsson, P., Dovč, K., Middlehurst, A., & Goss, P. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Management and support of children and adolescents with type 1 diabetes in school. *Pediatric Diabetes*, 19(17, Suppl.), S287–S301. <https://doi.org/10.1111/pedi.12743>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Bronfenbrenner, U. (1992). *Ecological systems theory*. Jessica Kingsley Publishers.
- Centers for Disease Control and Prevention. (2017, March 7). *National Diabetes Statistics Report*. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>

- Chinnici, D., Middlehurst, A., Tandon, N., Arora, M., Belton, A., Franco, D. R., Bechara, G. M., Branco, F. C., Rawal, T., Shrivastav, R. & Sung, E. (2019). Improving the school experience of children with diabetes: Evaluation of the KiDS project. *Journal of Clinical & Translational Endocrinology*, 15, 70-75. <https://doi.org/10.1016/j.jcte.2018.12.001>
- Craig, M. E., Jefferies, C., Dabelea, D., Balde, N., Seth, A., & Donaghue, K. C. (2014). Definition, epidemiology, and classification of diabetes in children and adolescents. *Pediatric Diabetes*, 15(20, Suppl.), S4–S17. <https://doi.org/10.1111/pedi.12186>
- Danne, T., Phillip, M., Buckingham, B. A., Jarosz-Chobot, P., Saboo, B., Urakami, T., Battelino, T., Hanas, R., & Codner, E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Insulin treatment in children and adolescents with diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S115–S135. <https://doi.org/10.1111/pedi.12718>
- Delamater, A. M., de Wit, M., McDarby, V., Malik, J. A., Hilliard, M. E., Northam, E., & Acerini, C. L. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: psychological care of children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S237–S249. <https://doi.org/10.1111/pedi.12736>
- DiMeglio, L. A., Acerini, C. L., Codner, E., Craig, M. E., Hofer, S. E., Pillay, K., & Maahs, D. M. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S105–S114. <https://doi.org/10.1111/pedi.12737>
- Dixe, M. D. A. C. R., Gordo, C. M. G. D. O., Catarino, H. B. P., Kraus, T., & Menino, E. P. D. S. G. (2020). Effects of an education program on knowledge and self-perception of school

personnel in preparing to care for type 1 diabetes students. *Einstein (São Paulo)*, 18.

https://doi.org/10.31744/einstein_journal/2020ao5101

Dobbins, M. (2017). *Rapid review guidebook steps for conducting a rapid review*. Hamilton Resource Details National Collaborating Centre for Methods and Tools.

Driscoll, K. A., Volkening, L. K., Haro, H., Ocean, G., Wang, Y., Jackson, C. C., Clougherty, M., Hale, D. E., Klingensmith, G. J., Laffel, L., & Deeb, L. C. (2015). Are children with type 1 diabetes safe at school? Examining parent perceptions. *Pediatric Diabetes*, 16(8), 613–620. <https://doi.org/10.1111/pedi.12204>

Edwards, D., Noyes, J., Lowes, L., Spencer, L. H., & Gregory, J. W. (2014). An ongoing struggle: A mixed-method systematic review of interventions, barriers and facilitators to achieving optimal self-care by children and young people with Type 1 diabetes in educational settings. *BMC Pediatrics*, 14(1), 1–27. <https://doi.org/10.1186/1471-2431-14-228>

Erhardt, E., & Molnár, D. (2004). Is type 2 diabetes mellitus a significant problem in European adolescents? *Scandinavian Journal of Nutrition*, 48(4), 155–160. <https://doi.org/10.1080/11026480410000445>

Ettekal, A. V., & Mahoney, J. L. (2017). Ecological systems theory. In K. Peppler (Ed.), *The Sage encyclopedia of out-of-school learning* (pp. 239–241). Sage. <https://doi.org/10.4135/9781483385198.n94>

Gesteland, H. M., Sims, S., & Lindsay, R. N. (1989). Evaluation of two approaches to educating elementary schoolteachers about insulin-dependent diabetes mellitus. *The Diabetes Educator*, 15(6), 510–513. <https://doi.org/10.1177/014572178901500607>

- Gnyawali, D. R., & Song, Y. (2016). Pursuit of rigor in research: Illustration from coopetition literature. *Industrial Marketing Management*, 57, 12–22.
<https://doi.org/10.1016/j.indmarman.2016.05.004>
- Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91–108.
<https://doi.org/10.1111/j.1471-1842.2009.00848.x>
- Gutierrez, C. 2020. Improving the care of students with diabetes in rural schools utilizing an online diabetes education program for school personnel. *Rural and Remote Health*, 20(1), 5596. <https://doi.org/10.22605/rrh5596>
- Gutiérrez-Manzanedo, J. V., Carral-San Laureano, F., Moreno-Vides, P., de Castro-Maqueda, G., Fernández-Santos, J. R., & Ponce-González, J. G. (2018). Teachers' knowledge about Type 1 diabetes in south of Spain public schools. *Diabetes Research and Clinical Practice*, 143, 140–145. <https://doi.org/10.1016/j.diabres.2018.07.013>
- Hatun, S., & Özcan, S. (2013). National programme in Turkey: Diabetes at school. *Diabetes Voice*, 58(1), 21–23.
- Helgeson, V. S., Orchard, T. J., Seltman, H., Becker, D., & Libman, I. (2019). Psychosocial predictors of diabetes risk factors and complications: An 11-year follow-up. *Health Psychology*, 38(7), 567–576. <https://doi.org/10.1037/hea0000730>
- Henderson, J. M. (1992). Teacher training and children with Type 1 diabetes. *Diabetic Medicine*, 9(7), 674–676. <https://doi.org/10.1111/j.1464-5491.1992.tb01867.x>

- Herbert, L. J., Clary, L., Owen, V., Monaghan, M., Alvarez, V., & Streisand, R. (2015). Relations among school/daycare functioning, fear of hypoglycaemia and quality of life in parents of young children with type 1 diabetes. *Journal of Clinical Nursing*, 24(9–10), 1199–1209. <https://doi.org/10.1111/jocn.12658>
- Husband, A., Pacaud, D., Grebenc, K., & McKiel, E. (2000). The effectiveness of a CD-ROM in educating teachers who have a student with diabetes. *Diabetes Research and Clinical Practice*, 50(1, Suppl.), S416. [https://doi.org/10.1016/S0168-8227\(00\)81416-3](https://doi.org/10.1016/S0168-8227(00)81416-3)
- International Diabetes Federation. (2019). *IDF Diabetes Atlas* (9th ed.). <https://www.diabetesatlas.org/en/resources/>
- Ješić, M. D., Milenković, T., Mitrović, K., Todorović, S., Zdravković, V., Ješić, M. M., Bošnjović-Tucaković, T., Marković, S., Vorgučin, I., Stanković, S., & Sajić, S. (2016). Problems in diabetes management in school setting in children and adolescents with Type 1 diabetes in Serbia. *Vojnosanitetski pregled*, 73(3), 273–276. <https://doi.org/10.2298/VSP150203007J>
- Joanna Briggs Institute. (2014). *Joanna Briggs Institute reviewers' manual 2014*. <https://nursing.lsuhsu.edu/JBI/docs/ReviewersManuals/Economic.pdf>
- Kalra, S., Mukherjee, J. J., Venkataraman, S., Bantwal, G., Shaikh, S., Saboo, B., Das, A. K., & Ramachandran, A. (2013). Hypoglycemia: The neglected complication. *Indian Journal of Endocrinology and Metabolism*, 17(5), 819–834. <https://doi.org/10.4103/2230-8210.117219>
- Kalweit, K. L., Briers, N., & Olorunju, S. A. (2015). The success of various management techniques used in South African children with type 1 diabetes mellitus. *South African Medical Journal*, 105(5), 400–404. <https://doi.org/10.7196/SAMJ.9334>

- Kaufman, F. R., Gallivan, J. M., & Warren-Boulton, E. (2009). Overview of diabetes in children and teens. *American Journal of Health Education*, 40(5), 259–263.
<https://doi.org/10.1080/19325037.2009.11770768>
- Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, 96(3), 118–121.
<https://doi.org/10.1258/jrsm.96.3.118>
- Khangura, S., Konnyu, K., Cushman, R., Grimshaw, J., & Moher, D. (2012). Evidence summaries: The evolution of a rapid review approach. *Systematic Reviews*, 1(1), 1–9.
<https://doi.org/10.1186/2046-4053-1-10>
- Kharroubi, A. T., & Darwish, H. M. (2015). Diabetes mellitus: The epidemic of the century. *World Journal of Diabetes*, 6(6), 850–867. <https://doi.org/10.4239/wjd.v6.i6.850>
- Krefting, L. (1991). Rigor in qualitative research: Assessment of trustworthiness. *The American Journal of Occupational Therapy*, 45(3), 214–222. <https://doi.org/10.5014/ajot.45.3.214>
- Lasecki, K., Olympia, D., Clark, E., Jenson, W., & Heathfield, L. T. (2008). Using behavioral interventions to assist children with type 1 diabetes manage blood glucose levels. *School Psychology Quarterly*, 23(3), 389–406. <https://doi.org/10.1037/1045-3830.23.3.389>
- Lee, J. M., Herman, W. H., McPheeters, M. L., & Gurney, J. G. (2006). An epidemiologic profile of children with diabetes in the US. *Diabetes Care*, 29(2), 420–421.
<https://doi.org/10.2337/diacare.29.02.06.dc05-2182>

- Lindsay, R., Jarrett, L., & Hilliam, K. (1987). Elementary schoolteachers' understanding of diabetes. *The Diabetes Educator*, 13(3), 312–314.
<https://doi.org/10.1177/014572178701300315>
- Lorenzi, D. G., & Trenney, R. (2015). Being prepared to teach and coach students with diabetes. *Journal of Physical Education, Recreation and Dance*, 86(4), 5–6.
<https://doi.org/10.1080/07303084.2015.1009806>
- Mahmud, F. H., Elbarbary, N. S., Fröhlich-Reiterer, E., Holl, R. W., Kordonouri, O., Knip, M., Simmons, K., & Craig, M. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Other complications and associated conditions in children and adolescents with type 1 diabetes. *Pediatric Diabetes*, 19(27, Suppl.), S275–S286. <https://doi.org/10.1111/pedi.12740>
- Maleki, M. M., Talakoub, S., & Abazari, P. (2016). Investigating the effect of teacher training program on understanding teachers' supportive behaviors by students with diabetes. *International Journal of Medical Research & Health Sciences*, 5(12), 186–190.
- Marks, A., Wilson, V., & Crisp, J. (2013). The management of type 1 diabetes in primary school: Review of the literature. *Issues in Comprehensive Pediatric Nursing*, 36(1-2), 98–119.
<https://doi.org/10.3109/01460862.2013.782079>
- Nimsgern, A., & Camponeschi, J. (2005). Implementing a new diabetes resource for Wisconsin schools and families. *Preventing Chronic Disease*, 2.
- Nuche-Berenguer, B., & Kupfer, L. E. (2018). Readiness of sub-Saharan Africa healthcare systems for the new pandemic, diabetes: A systematic review. *Journal of Diabetes Research*, 2018. <https://doi.org/10.1155/2018/9262395>

- Packer, M. J. (2018). *The science of qualitative research* (2nd ed.). Cambridge University Press.
- Pansier, B., & Schulz, P. J. (2015). School-based diabetes interventions and their outcomes: A systematic literature review. *Journal of Public Health Research*, 4(1), 467.
<https://doi.org/10.4081/jphr.2015.467>
- Patterson, C., Guariguata, L., Dahlquist, G., Soltész, G., Ogle, G., & Silink, M. (2014). Diabetes in the young: A global view and worldwide estimates of numbers of children with type 1 diabetes. *Diabetes Research and Clinical Practice*, 103(2), 161–175.
<https://doi.org/10.1016/j.diabres.2013.11.005>
- Peppas, A., Asonitou, K., & Koutsouki, D. (2011). Exercise training in students with diabetes: The role of pe teacher at school. *SportLogia*, 7(2), 177–184.
<https://www.sportlogia.com/no4engl/10.pdf>
- Pérez-Marín, M., Gomez-Rico, I., & Montoya-Castilla, I. (2015). Type 1 diabetes mellitus: psychosocial factors and adjustment of pediatric patient and his/her family. Review. *Arch Argent Pediatr*, 113(2), 158–162. <https://doi.org/10.5546/aap.2015.158>
- Pheiffer, C., Pillay-van Wyk, V., Joubert, J. D., Levitt, N., Nglazi, M. D., & Bradshaw, D. (2018). The prevalence of type 2 diabetes in South Africa: A systematic review protocol. *BMJ open*, 8(7), e021029. <https://doi.org/10.1136/bmjopen-2017-021029>
- Phelan, H., Lange, K., Cengiz, E., Gallego, P., Majaliwa, E., Pelicand, J., Smart, C., & Hofer, S. E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Diabetes education in children and adolescents. *Pediatric Diabetes*, 19(27, Suppl.), 75–83.
<https://doi.org/10.1111/pedi.12187>

- Pinelli, L., Zaffani, S., Cappa, M., Carboniero, V., Cerutti, F., Cherubini, V., Chiarelli, F., Colombini, M. I., La Loggia, A., Pisanti, P., & Vanelli, M. (2011). The ALBA project: An evaluation of needs, management, fears of Italian young patients with type 1 diabetes in a school setting and an evaluation of parents' and teachers' perceptions. *Pediatric Diabetes*, 12(5), 485–493. <https://doi.org/10.1111/j.1399-5448.2010.00722.x>
- Punthakee, Z., Goldenberg, R., & Katz, P. (2018). Definition, classification and diagnosis of diabetes, prediabetes and metabolic syndrome. *Canadian Journal of Diabetes*, 42(1, Suppl.), S10–S15. <https://doi.org/10.1016/j.jcjd.2017.10.003>
- Radjenovic, D., & Wallace, F. L. (2001). Computer-based remote diabetes education for school personnel. *Diabetes Technology & Therapeutics*, 3(4), 601–607. <https://doi.org/10.1089/15209150152811225>
- Raghupathy, P. (2015). Diabetic ketoacidosis in children and adolescents. *Indian Journal of Endocrinology and Metabolism*, 19(7), 55–57. <https://doi.org/10.4103/2230-8210.155403>
- Reinehr, T. (2013). Type 2 diabetes mellitus in children and adolescents. *World Journal of Diabetes*, 4(6), 270–281. <https://doi.org/10.4239/wjd.v4.i6.270>
- San Laureano, F. C., Manzanedo, J. V. G., Vides, P. M., de Castro Maqueda, G., Santos, J. R. F., González, J. G. P., & Ortega, M. D. C. A. (2018). Teachers' attitudes and perceptions about preparation of public schools to assist students with Type 1 diabetes. *Endocrinología, Diabetes y Nutrición*, 65(4), 213–219. <https://doi.org/10.1016/j.endien.2018.04.003>
- Schünemann, H., & Moja, L. (2015). Reviews: Rapid! Rapid! Rapid! ... and systematic. *Systematic Reviews*, 4(1), 4. <https://doi.org/10.1186/2046-4053-4-4>

- Schwartz, F. L., Denham, S., Heh, V., Wapner, A., & Shubrook, J. (2010). Experiences of children and adolescents with Type 1 diabetes in school: Survey of children, parents, and schools. *Diabetes Spectrum*, 23(1), 47–55. <https://doi.org/10.2337/diaspect.23.1.47>
- Sherry, N. A., & Levitsky, L. L. (2008). Management of diabetic ketoacidosis in children and adolescents. *Pediatric Drugs*, 10(4), 209–215. <https://doi.org/10.2165/00148581-200810040-00002>
- Siminerio, L. M., & Koerbel, G. (2000). A diabetes education program for school personnel. *Practical Diabetes International*, 17(6), 174–177. [https://doi.org/10.1002/1528-252X\(200009\)17:6<174::AID-PDI105>3.0.CO;2-4](https://doi.org/10.1002/1528-252X(200009)17:6<174::AID-PDI105>3.0.CO;2-4)
- Smart, C. E., Annan, F., Higgins, L. A., Jelleryd, E., Lopez, M., & Acerini, C. L. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Nutritional management in children and adolescents with diabetes.
- Smith, C. T., Chen, A. M., Plake, K. S., & Nash, C. L. (2012). Evaluation of the impact of a diabetes education curriculum for school personnel on disease knowledge and confidence in caring for students. *Journal of School Health*, 82(10), 449–456. <https://doi.org/10.1111/j.1746-1561.2012.00721.x>
- Taha, N. A., Rahme, Z., Mesbah, N., Mahmoud, F., AlKandari, S., Othman, N., Sharaikha, H., Lari, B. S., AlBeloushi, S., Saad, E., & Arefanian, H. (2018). Evaluation of the impact of a diabetes education eLearning program for school personnel on diabetes knowledge, knowledge retention and confidence in caring for students with diabetes. *Diabetes Research and Clinical Practice*, 139, 348–356. <https://doi.org/10.1016/j.diabres.2018.03.019>

- Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8(45).
<https://doi.org/10.1186/1471-2288-8-45>
- Thomas, J., O'Mara-Eves, A., Kneale, D., & Shemilt, I. (2017). Synthesis methods for combining and configuring textual or mixed methods data. In D. Gough, S. Oliver & J. Thomas (Eds.), *An introduction to systematic reviews* (pp. 182–209). Sage.
- Tolbert, R. (2009). Managing type 1 diabetes at school: An integrative review. *The Journal of School Nursing*, 25(1), 55–61. <https://doi.org/10.1177/1059840508329295>
- Tournilhac, C., Dolladille, C., Armouche, S., Vial, S., & Brouard, J. (2020). Evaluation of a new training program to reassure primary school teachers about glucagon injection in children with Type 1 diabetes during the 2017–2018 school year. *Archives de Pédiatrie*, 27(4), 212–218. <https://doi.org/10.1016/j.arcped.2020.02.002>
- Tricco, A. C., Antony, J., Zarin, W., Striffler, L., Ghassemi, M., Ivory, J., Perrier, L., Hutton, B., Moher, D., & Straus, S. E. (2015). A scoping review of rapid review methods. *BMC Medicine*, 13(1), 224. <https://doi.org/10.1186/s12916-015-0465-6>
- Vergnes, J. N., Marchal-Sixou, C., Nabet, C., Maret, D., & Hamel, O. (2010). Ethics in systematic reviews. *Journal of Medical Ethics*, 36(12), 771–774.
<https://doi.org/10.1136/jme.2010.039941>
- Wager, E., & Wiffin, P. J. (2011). Ethical issues in preparing and publishing systematic reviews. *Journal of Evidence-based Medicine*, 4(2), 130–134. <https://doi.org/10.1111/j.1756-5391.2011.01122.x>

Weber, M. (2017). *Methodology of social sciences*. Routledge.

Wolfsdorf, J. I., Glaser, N., Agus, M., Fritsch, M., Hanas, R., Rewers, A., Sperling, M. A., &

Codner, E. (2018). ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatric Diabetes*, 19(27, Suppl.), S155–S177. <https://doi.org/10.1111/pedi.12701>

Ziegler, R., & Neu, A. (2018). Diabetes in childhood and adolescence: A guideline-based approach to diagnosis, treatment, and follow-up. *Deutsches Ärzteblatt International*, 115(9), 146–156. <https://doi.org/10.3238/arztebl.2018.0146>

ADDENDUM A



Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 086 016 9698

Web: <http://www.nwu.ac.za>

**North-West University Health Research Ethics
Committee (NWU-HREC)**

Tel: 018 299-1206

Email: Ethics-HRECAppl@nwu.ac.za (for human
studies)

11 October 2019

RESEARCH ETHICS COMMITTEE LETTER OF DECISION: NO RISK

Based on the review by the North-West University Health Research Ethics Committee (NWU-HREC) on 11/10/2019, the NWU-HREC hereby clears your study as a no risk study. This implies that the NWU-HREC grants its permission that, provided the general conditions specified below are met, the study may be initiated, using the ethics number below.

Study title: The training of teachers in the management of children's diabetes at school: A Rapid Review

Principal Investigator/Study Supervisor/Researcher: Prof E van Rensburg

Student: S Elias - 30708346

Ethics number:

N	W	U	-	0	0	9	4	0	-	1	9	-	A	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation;
A = Authorisation

Application Type: Single study
Commencement date: 11/10/2019

Risk:

No Risk

General conditions:

The following general terms and conditions will apply:

- The commencement date indicates the first date that the study may be started.
- In the interest of ethical responsibility, the NWU-HREC reserves the right to:
 - request access to any information or data at any time during the course or after completion of the study;
 - to ask further questions, seek additional information, require further modification or monitor the conduct of your research;
 - withdraw or postpone clearance if:
 - any unethical principles or practices of the study are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the NWU-HREC or that information has been false or misrepresented;
 - submission of the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and/or
 - new institutional rules, national legislation or international conventions deem it necessary.
- NWU-HREC can be contacted for further information via Ethics-HRECAppl@nwu.ac.za or 018 299 1206

The NWU-HREC would like to remain at your service and wishes you well with your study. Please do not hesitate to contact the NWU-HREC for any further enquiries or requests for assistance.

Yours sincerely,



Digitally signed by Wayne
Towers
Date: 2019.10.11
12:43:03 +02'00'

Prof Wayne Towers
Chairperson NWU-HREC



Digitally signed
by Prof Minnie
Greeff
Date: 2019.10.13
18:21:13 +02'00'

Prof Minnie Greeff
Head of the Faculty of Health Sciences Ethics Office

Current details: (13210572) G:\My Drive\My Documents 20190227\NWU-HREC\NWU-HREC_Applications\NWU-HREC_Applications-2019\Applications 10-20191113\NWU-00940-19-S1(E van Rensburg-S Elias)-NR\NWU-00940-19-S1(E van Rensburg-S Elias)-LoD\9.1.5.4.3_LOD_NWU-00940-19-A1_11-10-2019.docm
11 October 2019

File reference: 9.1.5.4.3