

**What factors can affect the management of diabetes with regard to studying at university? A systematic review**

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**Abstract**

The purpose of this review is to identify and synthesise literature about diabetes management, and specifically, the barriers that may affect university students' Type 2 diabetes management. A systematic literature search was conducted using five databases: CINAHL, Google Scholar, PsychINFO, PubMed and Summon. Eligible articles from January 2010 to February 2017 were included in the review. Articles identified by the search which met the inclusion criteria were screened prior to selection for synthesis. A total of 2,577 articles were screened, of which 72 were fully assessed for synthesis. Of these, 22 met the inclusion criteria as they provided useful insights into the issue and were deemed relevant to enable the research question to be answered. These were included in the review.

This review found that individual and external characteristics play a significant role in diabetes management. Additionally, external stressors from university can lead to patients' non-adherence to medication regimens. The comprehensive review of the evidence in the current body of literature illustrates that a range of factors may affect university students' management of their Type 2 diabetes. Thus, it provides information that may inform how university well-being teams and policymakers support university students with Type 2 diabetes. Despite attempts being made to

undertake a comprehensive search, certain aspects restricted this, such as there being only a single researcher. Nevertheless, this review is important as it identifies a gap in knowledge about Type 2 diabetes management among the university student population. Importantly, this research found that there is a need for more empirical work to be undertaken within the university population to examine external stressors that may affect students' diabetes management.

**Keywords:** Diabetes mellitus, self-management, medication adherence, self-care, factors, Type 2, students, university

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## **Introduction**

Diabetes mellitus (DM) is a chronic metabolic disorder that occurs when blood sugars are too high (Diabetes UK, 2015). DM consists of two forms: Type 1 (T1DM) and Type 2 (T2DM). T2DM is the most common, accounting for 90% of all diabetes cases. Diabetes rates have risen globally: Ginter and Simko (2010) highlighted that diabetes has been a growing problem since the twentieth century. This increase coincides with a fall in physical activities, population growth and modern urbanisation, which Hu(2011) cited as factors contributing to the global rise. Research conducted by García-Pérez, Alvarez, Dilla, Gil-Guillén and Orozco-Beltrán (2013) highlighted that diabetes is also becoming increasingly common in adolescents and young adults.

Increased prevalence rates make diabetes a widely researched phenomenon. Research into diabetes self-management tends to be located within a dominant medical paradigm as it often entails the adoption of nutritional changes and physical activity modifications. Berenguera et al. (2016) described diabetes management as an intrapersonal phenomenon. Often individuals input emotional representations of their disorder (Berenguera et al., 2016). These representations can have a cognitive, behavioural and emotional impact on adaptations to living with diabetes and, retrospectively, their management of it.

This research aimed to examine the factors that affect a person's management of T2DM while at university. The increase of diabetes in young people means that one needs to consider the impact this will have on student populations. Mellinger (2003) posited that students often have highly variable schedules and unpredictable lives. Hence, this review can provide evidence for healthcare interventions and educational programmes for students with T2DM.

## **Aims of this study**

This review aimed to:

- Identify what aspects may affect the efficacy of individuals' diabetes management;
- Critically analyse studies on diabetes management;
- See how these factors may influence university students.

## **Formulating the research question**

The basis of this review was around a formulated research question using a scoping framework tool (Booth, Sutton, & Papaioannou, 2016). A scoping framework is a tool designed to facilitate a comprehensive search process allowing main concepts regarding the research question to be derived from it (Methley, Campbell, Chew-Graham, McNally, & Cheraghi-Sohi, 2014). The SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research Type) framework, developed by Cooke, Smith and Booth (2012), was used in this research as it was deemed most appropriate. PICO (Population, Intervention, Comparison and Outcomes), another widely used scoping framework developed by Fineout-Overholt and Johnston (2005) for the formulation of research questions, was considered. However, SPIDER provided a good basis from which to work because it can be used more efficiently (Cooke et al., 2012). This meant it was beneficial for this research as it enabled a consideration of sample (diabetic patients), phenomenon of interest (diabetes management), design (empirical), evaluation (attitudes or perspectives) and research type (qualitative/quantitative or mixed methods).

## **Methodology**

### ***Methodological approach***

There is a broad scope of definitions of what constitutes a research review. Fink (2010, p. 3) states that 'a research review is a systematic, explicit and reproducible

method for identifying, evaluating, and synthesising the existing body of research’.

There are several approaches for the synthesis of the literature, which often include critical, systematic, narrative, scoping or meta-synthesis. This study adopted a systematic approach to the review.

### ***Systematic review***

The adoption of a systematic review usually consists of adhering to a strict systematic protocol (Robson & McCartan, 2016), ensuring it is conducted in a rigorous manner. This makes a systematic review more favourable as it attempts to limit systematic errors, improving reliability and providing robust evidence from the literature. However, not all reviews adopt this approach; narrative reviews, which are frequently used, tend not to have a defined method or utilise a systematic approach to literature searching. This may result in issues regarding reliability (Aveyard, 2014) or methodological flaws which may result in bias (Cipriani & Geddes, 2003). Hence, the decision was taken to utilise a systematic approach.

## **Methods**

### ***Searching for literature***

The use of the most suitable database enables a comprehensive search (Ridley, 2012). Fink (2010) posits that choosing the wrong subject-specific databases has the potential to yield hundreds of unnecessary and irrelevant articles surrounding a phenomenon. Ensuring that this review contributed to a better understanding of diabetes management required the selection of appropriate databases, thus certifying that the technique used has a degree of academic legitimacy (Dolowitz, Buckler, & Sweeney, 2008). This research used subject-specific databases related to health (CINAHL, Google Scholar, PubMed, PsychINFO), library catalogues

(Summon) and bibliographies. This enabled the easy identification of reliable primary sources, which accords with Dolowitz et al.'s (2008) perspective.

### ***Key search terms***

Dolowitz et al. (2008) suggested that establishing key search terms ensures that the initial search is focused, and that valuable time is not wasted. Ridley (2012) suggested that the use of Boolean logic makes searches more sophisticated. The use of terms 'OR' and 'AND' allowed this research to adopt an advanced search approach. The search terms used were:

- Diabetes AND self-management
- Diabetes AND medication adherence OR compliance OR concordance
- Diabetes self-management AND biological factors OR social factors OR psychological factors
- Diabetes AND university OR college
- Diabetes knowledge AND self-management

The terms 'compliance' and 'concordance' (synonyms often replacing 'adherence') were used to reflect the diverse ways that medicine use is discussed. Adherence relates to a patient's conduct matching the prescribers' recommendations (Horne, Weinman, Barber, Elliot, & Morgan, 2005).

However, this research cannot claim that searches were 100% comprehensive and revealed all relevant literature on the topic; it is possible that some studies were missed. This accords with Evans (2002), who posited that it is possible to miss relevant studies because the focus of the literature does not become apparent in the title. However, this was potentially avoided as additional search strategies were adopted; reference list searches were incorporated. Mattioli et al. (2012) suggested

that although relevant search terms can yield an extensive search, additional methods can provide more literature.

### ***Inclusion and exclusion criteria***

Identification of literature for this study was undertaken using inclusion and exclusion criteria. Setting out selection criteria is important because it provides readers with knowledge about the review process (Aveyard, 2014).

The specific inclusion and exclusion criteria adopted in this study are set out below.

#### *Inclusion criteria*

- Related to factors affecting diabetes management;
- Published between 2010 and 2017;
- Published in a peer-reviewed journal;
- English language;
- Empirical/primary research.

#### *Exclusion criteria*

- Non-peer reviewed;
- Foreign language;
- Comorbidity focus;
- Non-accessible articles;
- Nurse- or practitioner-based research;
- Practical, policy-based and expert opinion.

### ***Grey literature and other sources***

Grey literature – non-academic journals, unpublished work, editorials and testimonials – were also among the literature excluded from the search. This is because they are often prone to subjective bias (Aveyard, 2014). It is acknowledged that it is possible for these sources to provide hidden evidence on the phenomenon of diabetes management. However, the availability of resources limited the search for grey literature and hard-to-reach articles.

### ***Selecting articles for review***

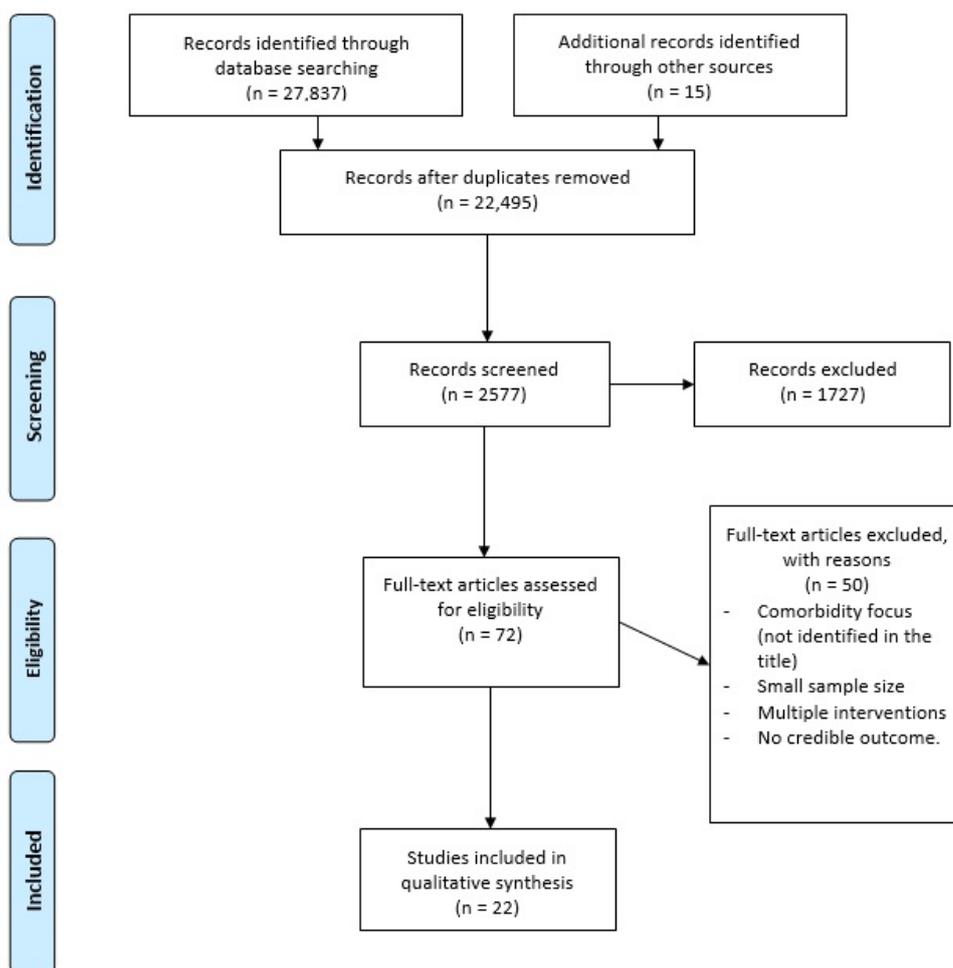
To assess each paper, the Critical Appraisal Skills Programme (CASP, 2017) guidelines for critically assessing the gathered research were utilised. This ensured that all studies were evaluated to determine usefulness and validity with equal rigour (Young & Solomon, 2009). Despite consideration of other appraisal tools, CASP (2017) is often accepted in this discipline and was deemed more suitable. However, the use of a critical appraisal tool is not without limitations. Critical appraisal tools can only assess what is reported within a study. Booth et al. (2016) highlighted that studies often do not publish enough details about methods; therefore, assessment is based on the quality of reporting. Crucially, the use of this instrument allowed the researcher to assess the validity of the results and to evaluate the literature and relevance of the studies. This ensured a rigorous approach to study evaluation, for example, by assessing methodological approaches in relation to research questions in reviewed studies (Zhu, Fish, Li, Liu, & Lou, 2016; Co et al., 2015). Additionally, reading abstracts, referring to the inclusion/exclusion criteria, and identifying whether literature was relevant and of high quality (ensuring that the study was not poorly carried out) were key to the selection of articles.

## Assessing the quality of studies

While articles generally provide varied results, the risk of publication bias is plausible. Publication bias refers to journals publishing articles based on the direction of their findings (Fink, 2010). The possibility of publication bias was addressed by examining studies' samples, age groups and countries to see whether there was an under-representation, which is common in studies on diabetes. Once these factors had been considered, a total of 22 articles were selected for inclusion in the review (see Figure 1: Search strategy overview).

**Figure 1**

Search strategy overview (source: Moher, Liberati, Tetzlaff, & Altman, 2009). Used with permission



### ***Reflexivity***

Reflexivity refers to how the research process is influenced by the researchers' values, experiences and interests (Finlay & Gough, 2003). This is often identified as a problem concerned with reliability (Malterud, 2001) and interpretations. The subjective experiences of the researcher, as a current student without diabetes, was considered while undertaking the research to ensure it did not affect analysis and interpretation.

### ***Ethical protocols***

It is often noted that literature-based research has little or no ethical considerations due to the absence of physical participants. However, Nosek, Banaji and Greenwald (2002) highlighted that it is not always possible to identify the procedures around consent that ensure ethical practice within research. That said, one key point to note is that this research may have incorporated data that participants may not have agreed to when they originally consented to take part in the research (Ritchie, Lewis, Nicholls, & Ormston, 2014). However, participants should have consented to the presentation of their data in the articles incorporated in this review, so this was not deemed problematic.

Furthermore, as this research aimed to include high-quality studies, there were underlying tensions between ethics and research quality. Ritchie et al. (2014) explained that researchers often face difficulties regarding ethical issues when attempting to produce high-quality research, asserting that attempts to obtain diverse and representative samples may lead to unethical approaches being used (Ritchie et al., 2014). This was borne in mind.

## Literature review

The studies that were selected for this review are set out in Table 1

**Table 1:** Meta-summary of included studies

Reference	Location	Method	Sample	Main Findings
Bains and Egede (2011)	USA	Validated surveys	125 men and women with T2DM	An examination of the association of health literacy, diabetes knowledge, self-care and glycaemic control. Main findings reported that health literacy was significantly related to diabetes knowledge. However, medication adherence or diabetes self-care were not significantly related to health literacy. Additionally, sociodemographic covariates were relevant factors with regard to health literacy, diabetes knowledge and medication adherence. Further, age was associated with diet and foot care, and race was associated with diabetes knowledge.
Balfe (2009)	UK	Semi-structured interviews and research diary	17 students (6 male, 11 female) aged 18–25	This study examined self-care routines among university students with T1DM and explored the barriers faced while at university. Findings illustrated that students had difficulty managing routines of self-care practices at university due to irregular schedules and social commitments.
Broadbent, Donkin and Stroh (2011)	Auckland, New Zealand	Questionnaires	157 patients (49 with T1DM and 108 with T2DM)	This cross-sectional study aimed to investigate diabetic patients' perceptions of their illness treatment and explored the relationship between adherence and blood glucose control. Findings showed that those with higher perceptions of personal control were more adherent to prescribed insulin medication. Moreover, beliefs and perceptions about the helpfulness of diet and exercise were related to exercise and diet adherence.
Carroll, Hammond and Leeper (2015)	USA	28-question survey tool	102 patients included in the study but only 46 completed the entire survey	This study sought to identify barriers that can impact on attendance to diabetes self-management classes. Transportation, time constraints and motivation were found to be some of the primary barriers to attendance. A major reason given for non-attendance was having an overall poor attitude

				towards diabetes management. They concluded that interventions such as online classes can be helpful for those with irregular schedules.
Cavanaugh et al. (2008)	USA	Cross-sectional survey	398 patients with T1DM and T2DM	The aim of this research was to examine the association between health literacy, numeracy and diabetes management. Findings revealed that fewer years of education, low reported income and low perceived self-efficacy were factors significantly associated with lower health literacy and numeracy.
Co et al. (2015)	Singapore	Questionnaires	213 patients with T2DM	This research examined how psychological distress, behavioural impact and Health-Related Quality of Life (HRQoL) among Asian patients with T2DM affect adherence to diabetes medication and self-care tasks. The findings showed a significant association between higher scores of psychological distress (living with diabetes and poor HRQoL). Disinhibited eating was classified as a specific behavioural impact of living with DM.
Cooke, Lee, Tong and Haines (2010)	USA	Cohort claims data analysis from existing medical records	1,769 cohorts	This study aimed to evaluate persistence with injectable anti-diabetic treatment among T2DM diabetic patients. Findings illustrated an association between injectable anti-diabetic treatment (such as insulin) and persistence during the course of medication treatment. Additionally, it was discovered that age is correlated with persistence; younger people were less likely to persist.
Fan, Lyons, Goodman, Blanchard and Kaphingst (2016)	Missouri, USA	Cohort data analysis from existing medical records	208 patients with T2DM	This study sought to investigate the relationship between overall medication non-adherence (UNA/INA) and health literacy. The findings showed that overall non-adherence was associated with limited health literacy. Other covariates were found to be associated was increased age. Increased age was associated with unintentional non-adherence. Low income and mental health problems were other covariates significantly associated with limited health literacy that affected adherence.
Farmer, Kinmonth and Sutton (2005)	UK	Questionnaires	121 patients with T2DM	This study sought to identify whether patients' beliefs about taking medication informed whether an intervention could aid medicines adherence. The findings claimed that negative beliefs about medication taking and difficulty taking medicines due to routine were significantly associated with reduced intention to

				take medication. Beliefs about the benefits of taking medication were strongly associated with taking medication regularly.
Fredette, Mawn, Hood and Fain (2016)	USA	Semi-structured interviews	24 university students with T1DM	The aim of this study was to examine the factors affecting the quality of life among college students living with T1DM. It reported three emerging themes: planning, thinking positively and seeking support. It suggested that participants tended to struggle with diabetes management when transitioning to university. Thus, it provided a better insight into and understanding of the experiences of those living with T1DM at university.
Graffigna, Barrello, Libreri and Bosio (2014)	Italy	Diary entries	29 patients with T2DM	This study explored the subjective attitudes to and experiences of disengagement with disease management. The findings illustrated that subjective experiential aspects such as thinking and feeling have an impact on the spheres of daily life. Diet and physical activity are considered to be crucial to diabetes management.
Hill, Gingras and Gucciardi (2013)	Canada	Focus groups	9 students	The aim of this study was to explore the lived experience of students with T1DM. The findings reported challenges with food within university (food offered on site) and a lack of diabetes awareness on site. Additionally, there were misunderstandings among peers, and the students experienced personal issue related to their diabetes. The results illustrated that there are exclusive challenges that can interfere with individuals' diabetes management at university.
Karter et al. (2010)	USA	Surveys and telephone interviews	169 participants	This study investigated the barriers to insulin prescription. The findings revealed that patients' genuine misconceptions about insulin risks affected the efficacy of their insulin taking.
Kolawole, Mosaku and Ikem (2009)	Nigeria	Questionnaires	53 patients with T2DM	This study aimed to measure, using a standardised questionnaire, the effect that T2DM has on patients' QoL. The findings showed that environmental factors have a significant association with a patient's QoL.
Kueh, Morris and Ismail (2017)	Malaysia	Cross-sectional questionnaires	137 female and 129 male participants	The aim of this study was to examine the effect that attitudes and diabetes knowledge have on patients' self-management and QoL. The findings revealed an association between diet and satisfaction. Additionally, it was found that those who had lower

				levels of satisfaction practised regular management of their diet less frequently. Further self-management of T2DM was associated with higher levels of QoL in relation to physical activity.
Pereira, Berg-Cross, Almeida and Machado (2008)	Portugal	Cross-sectional	157 patients with diabetes	This study aimed to investigate the impact that family factors has on diabetes management, QoL, metabolic control and treatment adherence. The findings revealed that increased QoL is associated with a lack of family conflict and increased social support. Additionally, adherence is also associated with strong family support.
Scaramuzza, De Palma, Mameli, Spiri, Santoro and Zuccotti (2010)	Italy	Questionnaires	215 students with diabetes and 464 in a healthy control group	This study compared diabetic students and their healthy peers to assess participation in risky behaviours. The findings highlighted that those in the diabetes group had higher rates of risky behaviour and were more likely to disengage from their treatment regimen.
Thurston, Bourg, Phillips and Huston (2015)	USA	Cross-sectional	192 patients with T2DM	The objective of this study was to determine if there is a relationship between health literacy and medication adherence. Additionally, it investigated the association between the two.
Uchenna, Ijeoma, Pauline and Sylvester (2010)	Nigeria	Cross-sectional survey	370 diabetic patients	The study aimed to investigate the association between identified factors: sociodemographic factors (age and gender), social factors and non-adherence in Nigeria. The findings showed that patients tended to feel helpless and socially isolated in relation to adherence to dietary regimens.
Walker, Gebregziabher, Martin-Harris and Egede (2015)	USA	Questionnaires	615 adults with T2DM	The purpose of this study was to identify the psychosocial determinants of health that influence diabetes management. The findings revealed that lower psychological distress was significantly related to diabetes self-care. low social support was found to be a social detriments of health including self-efficacy that were among the factors found to be strongly associated with diabetes self-care.
Zhu et al. (2016)	China	Cross-sectional questionnaires	397 patients with T2DM	The objective of this study was to identify the potential psychosocial predictors of QoL. The researchers discovered that QoL was related to psychosocial distress. They found that environmental factors were among the lowest domains that can affect a patient's QoL.

Zulman, Rosland, Choi, Langa and Heisler (2012)	USA	Questionnaires	1,834	The purpose of this study was to examine the psychosocial attributes of diabetes self-management. The findings revealed that even though all psychosocial attributes had a relationship with diabetes self-care, diabetes distress and self-efficacy had the strongest relationship.
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The themes that emerged from the analysis of the 22 articles in Table 1 regarding diabetes management are discussed below. However, due to a paucity of research focusing specifically upon university student populations with diabetes, this review draws upon a wider range of literature.

## **Living with Type 2 diabetes**

### ***Self-efficacy***

Being diagnosed with T2DM requires an almost instant lifestyle change involving nutrition management, physical activity, daily glucose monitoring, taking medication per schedule and reducing the risks of further complications such as cardiovascular disease (Yamashita, Kart, & Noe, 2011). This affects people differently, and the way it affects their Health-Related Quality of Life (HRQoL) also varies. While there is no universal definition of HRQoL, it is commonly defined as multi-dimensional aspects of life, including physical, emotional and social (Yamashita et al., 2012). Studies of HRQoL are gateways into assessing the efficacy of self-care.

Zhu et al.'s (2016) cross-sectional study of 397 patients with T2DM in Nanjing, China, examined the potential predictors of HRQoL for T2DM patients. Zhu et al. (2016) highlighted that a patient's HRQoL is often related to psychosocial elements of self-efficacy. This term is used to describe a patient's belief about their ability to take control of their diabetes care (Zhu et al., 2016). Previous studies have built on the elements that affect HRQoL. Kolawole et al.'s (2009) study of 53 Nigerian diabetic patients discovered that environmental factors scored highest in terms of affecting optimal diabetes management and HRQoL. However, although both studies used the same World Health Organization Quality of Life-BREF (WHOQOL-BREF) standardised questionnaire, Zhu et al. (2016) discovered that an individual's environment, including financial resources, displayed the lowest scores on the

questionnaire. The variation of findings reported in the two studies may have resulted from them being conducted in different socioeconomic contexts.

Additionally, an association between diet and QoL was reported by Kueh et al. (2017), whose sample comprised 266 diabetic patients in Kelantan, Malaysia.

Standardised measures were used to examine the effects knowledge and attitudes have on diabetes management and patients' QoL. Kueh et al. (2017) stated that patients who practised frequent compliance to nutritional management had more QoL satisfaction. Similarly, Co et al. (2015) studied the factors that correlate with HRQoL among 213 Singaporean T2DM patients. They utilised several standardised questionnaires to identify factors associated with behavioural impact and psychological distress concerning HRQoL. Co et al. (2015) established that HRQoL is determined by diabetes-related stress caused by the burden of living with diabetes, such as dietary constraints. Research into QoL is predominantly quantitative, although QoL is arguably best examined qualitatively as it enables participants to speak more broadly about the effect that diabetes has on their QoL (Speight, Reaney, & Barnard, 2009).

### ***Studying at university with diabetes***

Although the focus of this review is on how diabetes management, particularly T2DM, affects the student population, evidence is limited. Fredette et al. (2016) investigated the QoL of 24 college students living with T1DM, in the Northeast of the United States of America (USA), using semi-structured interviews. Fredette et al. (2016) highlighted that students with T1DM may find themselves psychologically and physiologically stressed, as significant adjustment is required when transitioning into college life; this is challenging. This is crucial, too, as it is recognised that environmental factors impact on self-efficacy and management of the disorder (Zhu

et al., 2016). Significantly, Fredette et al. (2016) suggested that college students tend to view chronic illness as a disruption to their education. Participants also exhibited feelings of social isolation due to the difficulty of sharing their diagnosis with their peers. This can be problematic, in that social support, from family and peers, plays a pivotal role in the management of one's diabetes (Pereira et al., 2008).

Additionally, Hill et al. (2013) examined the lived experience of nine university students in Canada with T1DM. Focus groups were used to explore the challenges that interfere with diabetes management. Irregular schedules and emotional and psychological barriers such as stress and insufficient or lack of social support were some of the factors identified as interfering with medicines adherence. This is due to the unpredictable nature of T1DM, which can be challenging for those with demanding, stressful routines. Scaramuzza et al. (2010) also researched social commitments in the student population and established that social events, such as drinking alcohol, are difficult to participate in due to the harmful consequences it may lead to for people with diabetes.

Research has also established that college students with T1DM face challenges such as decisions on food choices, living in student accommodation, and balancing exercise, studying and social commitments (Balfe, 2009). This means students have to attempt to adopt new coping strategies to balance their university demands.

### **Behavioural and psychological characteristics**

Self-management has been universally defined as a person's ability to manage treatment, symptoms and dramatic lifestyle changes (Bagnasco et al., 2013). In the context of T2DM, the management of one's chronic disorder plays a significant role

requiring patient-driven actions (Yamashita et al., 2011). These patient-driven behaviours are all significant to the progression of DM and reducing potential further harm to vital organs. However, diabetes management can often be affected by a patient's attitude, knowledge, adherence and beliefs (Nam, Chelsa, Stotts, Kroon, & Janson, 2011).

Ahola and Groop (2013) suggested that a lack of understanding of physician recommendations is likely to increase the likelihood of non-adherence. Hence, education programmes are often put in place to improve diabetes knowledge. Similarly, Carroll et al. (2015) examined 46 American diabetic patients attending diabetes education classes and discovered that barriers, including transportation and motivation, were additional factors that hindered attendance at educational management classes. Despite this, Carroll et al. (2015) reported that poor attitudes to diabetes self-management were most likely to explain non-attendance at education classes. Therefore, Carroll et al. (2015) proposed that online education classes be implemented to avoid barriers such as transportation. This may also be beneficial for those who have busy schedules.

Farmer et al. (2005) suggested that patients' attitudes can affect diabetes management. They used a questionnaire to measure beliefs, intentions and self-reported behaviour among 121 British T2DM patients recruited through General Practice (GP) registers in Buckinghamshire. Despite this research falling outside the criteria for this study, it is pertinent because the findings revealed that positive beliefs towards taking diabetes medication resulted in more effective medication compliance. However, the significance of these findings aside, Farmer et al.'s (2005) study used a voluntary postal questionnaire, so it is unlikely that the results will be representative of the non-adherent target population .

## **Adherence**

A further context for the management of diabetes that often appears in the literature is that of adherence. This concept is concerned with the extent to which individuals follow instructions given by medical professionals (Clark, 2004).

Studies on adherence derive from several psychological theories such as the Theory of Planned Behaviour (TPB) (Ajzen, 1985) and the Health Belief Model (HBM) (Rosenstock, 1974). The TPB outlines the relationship between behaviour, beliefs and intentions, while the HBM suggests that adherence derives from a patient's perceptions about their susceptibility to complications due to their chronic disorder. Previous research has also suggested that limited health literacy is common among individuals with diabetes, resulting in issues concerning adherence (Cavanaugh et al., 2008). Bains and Egede (2011) conducted research into the associations between self-care, glycaemic control and health literacy in a low-income population with T2DM. Completed patient assessments regarding health literacy and diabetes knowledge and management were utilised. It was reported that despite limited health literacy being significantly related to diabetes knowledge, no relationship was found between health literacy and medicine non-adherence rates (Bains & Egede, 2011). Conversely, the findings of Fan et al. (2016) appear to refute Bains and Egede's (2011) earlier claim. This research also involved an investigation of the relationship between health literacy and adherence. However, while their study population were also predominately from minority and low-income groups similar to those of Bains and Egede (2011), Fan et al. (2016) suggested that, on the contrary, increased unintentional non-adherence (UNA) is associated with limited health literacy and knowledge.

Research into the relationship between health literacy and adherence has mixed results. The difference in results in the two studies may be due to the classification of the several types of medication adherence. Non-adherence comprises two categories: UNA and deliberate/intentional non-adherence (INA) (Clark, 2004). UNA refers to barriers that hinder a person's treatment regimen, such as low health literacy or forgetting, whereas INA is where an individual intentionally avoids taking medication (Clark, 2004). Therefore, combining the two categories can be problematic because people may have simply forgotten to take their medication and also have limited health literacy but are not completely non-adherent.

Thurston et al. (2015), in their study of 192 T2DM patients, also identified that there was no association between limited health literacy and overall medicines non-adherence. However, they found increased links between limited health literacy and forgetting to take medication in disadvantaged patients, which was linked to their ability to access comprehensive health care and racial disparities. Forgetting is encompassed in UNA and therefore resembles the results in Fan et al.'s (2016) study.

### ***Bio-psychosocial demands***

Diabetes management requires several behavioural adaptations that individuals often find challenging to incorporate into their pre-existing life. These are commonly known as bio-psychosocial demands and refer to the biological (treatment type), psychological (emotional distress) and social (constant strain of diabetes maintenance) aspects that may affect diabetes management (Richmond, 1998). Graffigna et al. (2014) collected diary entries from patients on the factors that hinder engagement in health management. The findings indicated that patients often give meaning to their diabetes management through a 'complex frame of subjective

experiential dimensions' (Graffigna et al., 2014, p. 1), and this has an impact on diabetes management.

### ***Biological factors***

Research by Cooke et al. (2010) suggested that adherence is low due to the type of treatment used: injections and oral medication. García-Pérez et al. (2013) supported this view and outlined that the complexity of a patient's regimen is also likely to affect medicines adherence. Additionally, Broadbent et al. (2011) established, from their sample of 157 T1DM and T2DM patients in New Zealand, that a person's perception of the efficacy of their medication can also affect adherence. Perceptions about medicine are important to note, as patient's perceptions of their illness affect how they will cope and manage their chronic disorder, an essential feature developed in the HBM.

### ***Psychological factors***

Psychological traits such as a person's identity can affect adherence (Nash, 2013).

In a sample of 615 patients with T2DM in South-Eastern United States, Walker, Gebregziabher, Martin-Harris and Egede (2015) established an association between psychological distress and a patient's efficacy of diabetes self-care. They conceptualised psychological factors into three domains: psychological distress, social support and self-efficacy.

Diabetes-related psychological distress can encompass a range of emotions, such as feeling discouraged about a treatment plan (Zulman et al., 2012). Zulman et al.'s (2012) findings, from a study population of patients over the age of 50, suggest that diabetes self-management is strongly associated with a patient's psychosocial attributes. They established that emotional distress was related to age, and decreased as age increased (Zulman et al., 2012). However, it is important to note

that this study did not differentiate between the patient's length of diagnosis, which can be a significant factor for adherence rates (Yamashita et al., 2011).

### **Social factors**

Social factors play a substantial role in the effectiveness of one's adherence (Nash, 2013). Karter et al. (2010) discovered from their survey of 169 T2DM patients that 35% of those on insulin medication who were non-adherent believed that insulin would cause harm.

Social support from friends and families can help maintain a patient's medication adherence. Pereira et al.'s (2008) study, despite falling outside the criteria, investigated the impact of family factors on diabetic adolescents. Significantly, they discovered that stable dimensions in families improved adherence. Further, the study provided evidence that enhanced social support improves the ability to live with a chronic illness. Conversely, Uchenna et al. (2011) countered Pereira et al.'s (2008) claim by proposing that activities such as family members not eating like the diabetic individual can affect adherence to dietary management due to feelings of isolation.

### **Discussion**

Studies within this review revealed conceptual evidence about the phenomenon of diabetes management. Nam et al. (2011) and Fredette et al. (2016) explored the context of self-management, emphasizing that it is a multi-factorial phenomenon; no distinct factor can affect its management alone.

Adapting to hectic student schedules plays a role in the effective management of diabetes. Results highlight the pertinence of an individual's personal confidence in their diabetes management, including self-efficacy, motivations and attitudes. A distinction was made in the literature among university students relating to problems around establishing self-care routines, highlighting that irregular schedules and

emotional and psychological barriers are key impediments to one's adherence (Hill et al., 2013)..

### ***Self-confidence and theory***

Shrivastava, Shrivastava and Ramasamy (2013) found that patients with diabetes have a higher impact on their disease progression if they participate in self-care. In this review, a patient's self-efficacy has repeatedly been emphasised (Chew, Shariff-Ghazali, & Fernandez, 2014). Self-efficacy and the Theory of Self-Regulation (TSR) (Bandura, 1991) provide explanation for the execution of certain behaviours. This theory explains how individuals' beliefs about their own efficacy can cause them to make choices about disease management behaviours (Bandura, 1991). Zhu et al. (2016) reported that psychosocial factors of life often affect self-efficacy, including environmental factors. Bandura (1991) explained that external influences affect a person's exercise of certain behaviours. The TSR explains that environments, such as an individual's educational structures, can affect their self-efficacy belief, emotional states and other self-regulatory influences; this, in turn, can affect the underpinnings of motivation and self-management (Bandura, 1991). The relationship between self-efficacy and one's diabetes is important to note for university well-being teams because it may ensure that factors in the environment that negatively affect a person's self-efficacy are minimised.

The effects of a demanding medical regimen for people living with diabetes have frequently been researched using QoL measurements (Zhu et al., 2016; Kueh et al., 2017). Most studies report that this is due to the broad impact diabetes has on an individual's life, which affects how well they manage it. Despite presumed common values found in the literature, there is no objective standard that every individual subscribes to, and therefore, what affects a person's self-management is subjective.

Regarding university students, if the most common factors were accommodated for, their QoL while at university could be improved.

### ***Individualism***

Often diabetes management is predicated on an individualistic ideology, where individuals tend to be personally accountable for performing the right task.

Understanding the different categories that non-adherence falls under will enable university policymakers to implement interventions around the different predictors that affect adherence. Variables such as education, length of diagnosis and irregular schedules have been identified as key predictors to adherence (Yamashita et al., 2011; Hill et al., 2013).

Furthermore, focusing on an individualistic approach to diabetic patients' health literacy and knowledge was found to influence self-management, while Shrivastava et al. (2013) emphasised that effective care can only succeed if patients, friends and family are informed about taking adequate care. Indeed, several researchers identified the importance of implementing education classes to improve knowledge (Ahola & Groop; Carroll et al., 2015.) and self-management. Reyes-Velazquez and Hoffman (2011) reported that university students without diabetes can also benefit from these classes. The implementation of this intervention in universities may reduce the rapid increase in the prevalence of diabetes among students and allow diabetic students to better adapt to ever-changing schedules. It could also improve knowledge and awareness of diabetes in general, allowing a social support mechanism for potential diabetic peers.

### ***Diabetes management***

Developments in understanding diabetes management are centred around psychological theories, such as TPB (Ajzen, 1985). The literature recognises that the

attitudes and intentions of individual patients can influence their adherence to medical regimens (Carroll et al., 2015). Azjen (1985) explained how attitudes, subjective norms and perceived behavioural control motivate intentions. Subjective norms (the influence a significant other has on an individual's perception of a behaviour (Bandura, 1991)) can be significant for university students as there may be a negative increase in social pressure that can hinder prescribed regimens (Fai, Anderson, & Ferreros, 2017). Fai et al. (2017), in their cross-sectional study of 115 African Americans, highlighted that perception about ease of taking medication according to schedule increases as the degree in which others favourably evaluate their behaviour increases. This emphasises the importance of others viewing specific diabetic actions in a favourable light to allow the ease of social pressure on those with diabetes, especially within universities.

### ***Social support***

The synthesised literature revealed a positive relationship between social support and diabetes management. Social support from families can provide buffers to the stressors of living with this chronic disorder (Miller & Di Matteo, 2013). It can provide significant mechanisms relating to an individual's subjective norm (TPB), allowing the reduction of social pressures. Further, social support can provide help for the patient to remain active and adhere to medication when they are faced with the stressors of university.

### **Study limitations**

Firstly, due to there being a single researcher, the interpretations and conclusions are based on one person; this may lead to bias as it is built on individual experiences and ideas about this phenomenon. Booth et al. (2013) asserted that having a second reviewer check a sample of articles for quality can be beneficial. Additionally, although

multiple sources of literature were identified, limits on financial resources restricted the researcher's access to some potentially useful studies.

## **Conclusion**

Universities are gateways to knowledge generation and new experiences. However, this has potential implications for those affected by chronic disorders that are socially demanding. Knowledge of the factors that influence diabetes management is important to outline, as effective management is key to reducing the possibility of future comorbidities. The importance of this review was identified after an initial reading of the literature, which revealed a gap in knowledge. It is important because of the ever-growing prevalence of diabetes among students (García-Pérez et al., 2013), and the paucity of literature on this population.

Further, contemporary research on diabetes management addresses several interesting, conceptual themes regarding the factors that affect a patients' ability to adhere properly. The foundations of diabetes management can be complex, as numerous factors can affect this phenomenon.

The aim of this review was to identify what issues affect diabetes management when studying at university. It revealed that an individual's socioeconomic status, length of diagnosis, education, psychological attributes and social support mechanisms are factors affecting effective diabetes management. Additionally, a lack of social support, irregular schedules and difficulty in making food choices affects students. Additional demands from university may provide external stressors which can further affect a person's adherence/non-adherence. Therefore, it is essential for universities to consider these factors to minimise these stressors. Further, beliefs around illness (Broadbent et al., 2011) has been acknowledged to affect one's capability in terms of

disorder management and is considered as a distinct factor affecting diabetic students while at university. Therefore, this review has highlighted that a single based intervention may be hard to implement in current practices because of the complex nature of diabetes management.

### ***Recommendations***

Current statistics show that the prevalence of diabetes in young adults is on the rise (Diabetes UK, 2016). This indicates a need to undertake further research to develop a better understanding of this phenomenon in university populations.

Additionally, as social determinants such as financial resources and housing can affect diabetes management, these factors should be examined. Research is also needed on students with T2DM living away from home while at university to examine what factors affect their diabetes management. Identification of the factors that influence diabetes management while at university can help institutions adapt, thus enabling the environment and university schedules to become more diabetes-friendly.

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