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A Qualitative Approach Exploring the Experiences of Smoking and Quitting Attempts in Type 1 Diabetes

Running title: Experiences of Type 1 Diabetes Smokers

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Abstract

Aims and objectives

To explore the experiences of smoking and quitting attempts in people with Type 1 Diabetes (T1D), including their perceptions of existing services for smoking cessation.

Background

In the UK, approximately a fifth of the population with T1D smoke and despite the adverse effects of smoking, these individuals continue with their smoking habits. There is limited information on the barriers and facilitators to quitting smoking in people with T1D.

Methods: This study adopted a qualitative study design using semi-structured individual interviews guided by PRIME theory. Participants ($n = 12$) were purposively sampled and recruited from two diabetes outpatient clinics in London (UK). Audio-recorded interviews were transcribed verbatim and analysed using the Framework method.

Results

Most smokers with T1D reported lack of motivation to stop smoking due to the addictive nature of cigarettes. Further barriers to quitting included self-image and habits associated with smoking; such as social activities. Generally, most reported limited awareness about the risks associated to smoking and diabetes. Moreover, the perceived negative attitude towards nicotine replacement therapy and pharmacotherapy impeded their willingness to alter their smoking habits. Nonetheless, these patients suggested that informative guidance from medical professionals and strategies to tackle cravings related to nicotine as helpful approaches to improve quitting attempts.

Conclusion

Internal and external factors influence quitting attempts among smokers with T1D, with particular emphasis on self-image and societal norms. It is evident that existing strategies for smoking cessation recommended by the National Institute for Health and Care Excellence have either not been implemented or not well-received by people with T1D.

Relevance to clinical practice

Strategies and resources, such as staff training, to increase delivery of smoking cessation support to patients with diabetes are needed.

Keywords

Smoking, tobacco, cigarette, nicotine, smoking cessation, type 1 diabetes, insulin-dependent diabetes mellitus, PRIME theory

What does this paper contribute to the wider global clinical community?

- Despite existing resources and services for smoking cessation, people with Type 1 Diabetes (T1D) are not motivated to quit smoking and deem these measures as ineffective.
- Self-image, societal pressures and misconceptions about nicotine replacement therapy are key factors that hinder quitting attempts among individuals with T1D.
- Limited educational and healthcare support are offered to people with diabetes who smoke.

Introduction

In the UK, 15.5% of the adult population smoke (Office for National Statistics, 2017) and the smoking prevalence is similar for Type 1 Diabetes (T1D) (17%) but slightly lower in Type 2 Diabetes (T2D) (12%) (NHS Digital, 2017). In 2006, it was estimated that £5.2 billion was spent by the National Health Services (NHS) for smoking-related ill health; accounting for 5.5% of the total health care expenditure (Health and Social Care Information Centre, 2015). Smoking has been shown to enhance the risk of morbidity and mortality among people with diabetes (Lopez Zubizarreta, Hernandez Mezquita, Miralles Garcia, & Barrueco Ferrero, 2017). In 2010/11, the financial costs of complications of diabetes to the NHS amounted to £8 billion, and this cost is projected to increase to £13.5 billion in 2035/2036 (Hex, Bartlett, Wright, Taylor, & Varley, 2012).

According to the 2015-2016 UK national diabetes audit report, fewer patients with T1D (78.5%) received care for smoking in comparison to Type 2 Diabetes (T2D) (85.2%) (NHS Digital, 2017). However, it is not clear what form of care; such as brief advice, behavioural support, nicotine replacement therapy [NRT]), was offered to these patient groups. Nonetheless, people with diabetes who quit smoking were reported to improve their glycaemic control (Lycett et al., 2015), reduce their odds of all-cause mortality (Blomster et al., 2016) and had 40% fewer hospital admissions (Tran, Falster, Douglas, Blyth, & Jorm, 2015). Moreover, individuals with T1D would probably gain more immediate benefit from quitting than people with T2D (Lycett et al., 2015). Therefore, quitting smoking would overall improve health outcomes and could decrease health care expenditure associated with diabetes and its secondary complications.

Background

The National Institute for Health and Care Excellence (NICE) guidelines propose NRT, pharmacotherapy and counselling for patients who wish to quit smoking (National Institute for Health and Care Excellence, 2013). Whilst every smoker is different, there are some groups that have enough in common to justify the development of tailored evidence-based approaches to smoking cessation. People with diabetes have difficulties coping with the expected changes in their lifestyle and patients with T2D have been found to hold misconceptions which affect their intention to quit smoking (Chau et al., 2015). There is a dearth of evidence of efficacy on

tailored smoking interventions for diabetic patients (Nagrebetsky, Brettell, Roberts, & Farmer, 2014). However, a retrospective pooled analysis of 15 RCTs examining the efficacy of the smoking cessation drug varenicline in smokers with diabetes showed a higher abstinence rate in the intervention arm compared to the placebo group at 3 months (43.8% and 24.8%, respectively) (Tonstad & Lawrence, 2017). The abstinence rate markedly declined to 18.4% after 1 year follow-up in the varenicline-treated group (Tonstad & Lawrence, 2017); suggesting short-term benefit. Psychotherapeutic approaches to quit smoking in people with diabetes showed a success rate between 17% - 50% (Canga et al., 2000; Hokanson, Anderson, Hennrikus, Lando, & Kendall, 2006; Persson & Hjalmarson, 2006; Thankappan et al., 2013). Moreover, patients in the nurse-led smoking cessation intervention group, who continued to smoke, significantly reduced their cigarette consumption by 23% at 6 months follow-up (Canga et al., 2000). Only one RCT examined relapse at 6 months follow-up after a smoking cessation intervention (Hokanson et al., 2006), and only one trial included a 12-month follow-up but did not assess relapse (Persson & Hjalmarson, 2006). Thus, it is not clear whether relapse would be greater in a trial with a follow-up period longer than 6 months.

Whilst most of the literature focuses on smoking and smoking cessation in T2D, little is known about the experiences of people with T1D. Moreover, it is not clear which resources or services for smoking cessation would be most useful for T1D, as authors mostly assessed patients with T2D or pooled analysis of both types of diabetes (Canga et al., 2000; Hokanson et al., 2006). The smoking behaviour of patients with T2D, as well as current and former smokers without diabetes, was previously examined using various theoretical frameworks including theory of planned behaviour and PRIME respectively (Chau et al., 2015; Uppal, Shahab, Britton, & Ratschen, 2013; Vangeli & West, 2012). PRIME (plans, responses, impulses, motives and evaluations) theory of motivation explores the underlying components involved in the decision-making process to quit smoking, assessing people's beliefs, responses, impulses, motives and plans to alter their smoking behaviour (West, 2009). Cigarette addiction arises from multiple sources feeding into the motivational system; including the feelings of 'wanting' to smoke to achieve pleasure and satisfaction, the 'need' to smoke to quell the 'nicotine hunger' and beliefs on the benefits of smoking. These constructs along with external cues influence the end point response deterring quitting attempts and prompting smoking relapse events (McEwan & West, 2010). Knowledge of the different components involved in tobacco addiction could inform policymakers to develop more robust smoking cessation interventions for populations who present chronic conditions.

Aims of the study

To explore the beliefs, experiences and attitudes of smokers with T1D towards smoking and its cessation using a qualitative approach using PRIME theory.

Methods

Design

This qualitative study used semi-structured, audio-recorded individual interviews to understand the experiences and beliefs of smokers with T1D towards smoking and quitting smoking, including their perceptions of existing services for smoking cessation.

Participants and settings

Twelve out of 14 eligible participants were recruited from two diabetes outpatient clinics in London (UK) using purposive sampling based on the eligibility criteria including patients above 18 years of age with T1D, current or occasional smokers who have smoked at least 100 cigarettes in their lifetime and able to converse in English. Individuals with T2D, ex-smokers and non-smokers with T1D were excluded from the study. Study details were conveyed by diabetes specialist nurses and further information was provided by the primary investigator. Written informed consent was obtained face-to-face or by post prior to the start of the study. Recruitment continued until data saturation was achieved, whereby no new information was obtained. No monetary or other incentives were given for participation.

Data collection

Before the interview, participants completed a questionnaire on their demographics, diabetes and smoking profile either face-to-face ($n = 6$) or completed by the researcher over Skype ($n = 2$) or telephone ($n = 4$). Individual interviews were conducted by the same researcher in privately secured meeting rooms at the diabetes outpatient clinics in London, or *via* telephone or Skype, lasting approximately 35 minutes. An interview topic guide was used to steer the individual semi-structured interviews and some of the questions were guided by the PRIME theory (West, 2009) addressing: beliefs about smoking, plans to continue or quit smoking. The

perceived effectiveness of policies and services for smoking cessation were additionally explored (Table 1). Data collection was performed between May 2016 and June 2016.

Data analysis

Baseline characteristics were expressed as mean ± standard deviation (S.D.) or presented as ranges. Recorded audiotapes were transcribed verbatim with anonymisation and subsequently coded using NVivo10®. Two authors independently coded the transcripts and analysed the data using the Framework approach (Ritchie, Lewis, McNaughton Nicholls, & Ormston, 2013) using a combination of inductive and deductive methods, whereby emergent themes were identified and then organised according to the different components of the PRIME theory respectively (West 2009). The Framework approach was performed in accordance to the methods of Ritchie *et al.* (2013) that comprise of five analytical stages including familiarization and coding of textual data, development of thematic framework, indexing of textual data to categorised themes, charting the indexed data, and finally mapping and interpreting the charted information to finalise the conceptual framework. Discrepancies throughout the analytical process were resolved by consensus.

Trustworthiness

Scientific rigour and transparency of research findings were established by providing thick description of the studied phenomenon, investigator triangulation, use of informants' quotes, reflexivity and audit trail. These methods encompass Lincoln and Guba's approach (Lincoln & Guba, 1985) to achieve trustworthiness in qualitative research. Response bias was minimised due to the explicit transparency of the researcher's occupational role; increasing credibility of research data.

Reflexivity

Developing good rapport with participants is imperative to ensure greater response rate and avoiding concerns related to judgemental biases. The researcher stated their profession as a clinical researcher with a background in psychopharmacology to the participants and mentioned that she was not involved in their clinical care. This helped establish a comfortable

neutral environment for respondents to disclose their personal information. To validate the interpretation of the interview data, two authors independently analysed the qualitative data. Results were then compared and reviewed to develop a more broad understanding of the studied phenomenon based on each of the investigator's perspective. Differences in data interpretation were resolved through joint discussions until consistency was achieved.

Ethical considerations

This research was conducted in accordance to the principles of the Declaration of Helsinki (seventh revision 2013) (World Medical Association, 2013) and Good Clinical Practice (National Institute for Health Research, 2016). Ethical approval for this study was granted by South West Exeter Research Ethics Committee (*REC reference 16/SW/0048*) in the NHS Health Research Authority.

Results

Participant characteristics

Twelve participants with T1D were recruited and their demographics, smoking and diabetes profile are illustrated in Table 2. One third of the participants were female and the mean age of the total respondents was 33.7 years (range: 25 – 50). Over 50% of the participants were single and two thirds of these individuals have post-secondary education or tertiary educational qualifications. Approximately 85% of these patients were employed and all of the sample was white. The age of diagnosis for diabetes varied considerably ranging from 3 to 45 years (mean 17.9 years) and the average years living with diabetes was 15.7 years. All individuals reported to manage their diabetes either through multiple daily insulin injections (68%), insulin pump (25%) or twice-daily insulin injections (8%).

The smoking profile of the participants indicated that all individuals claimed to have smoked at least 100 cigarettes in their lifetime. Only one participant reported to smoke less than one cigarette per day whilst the remainder stated to smoke between three to 20 cigarettes daily, with a mean of 8.2 (S.D. = 5.4). More than half of the respondents consumed their first cigarette in the morning, varying between 10 to 60 minutes after they wake up or as an accompaniment

with their morning coffee. Overall, 11 out of 12 participants reported to have attempted to quit smoking in the past.

Table 2. Characteristics of smokers with T1D

Initial analyses through an inductive approach identified 14 codes. These codes were grouped into five major themes that coincided with the different components of the PRIME theory. Themes and subthemes were then refined and categorised using deductive methods based on the constructs of the PRIME theory (Figure 1).

Figure 1. Emergent themes and subthemes in accordance to the PRIME theory.

Plans to alter smoking behaviour

Most participants believed that their decision-making to abstain from smoking was their personal choice and would not influenced by others (Table 3). Some mentioned that they would seek smoking cessation guidance and support from their GP and one preferred to search the internet for information on smoking cessation support.

Drinking tea or having food were potential strategies voiced by a few of the respondents to help them avoid smoking. Restricting cigarette consumption at home and limiting the number of cigarettes taken during outings were anticipated to reduce their nicotine intake (Table 3). Implementing a no smoking rule when finances are limited was a strategy that one participant set for themselves (Table 3) and setting goals to reduce their cigarette consumption periodically could help them during their quitting process.

Table 3. Key subthemes representing the "*plans*" component of the <u>P</u>RIME theory.

Smoking behaviouR in T1D patients

Participants discussed their smoking history and many mentioned that they started smoking due to social conformity and acceptability of tobacco use; whilst others reported that peer pressure instigated their smoking behaviour (Table 4). Additionally, various internal and external triggers enticed their decision-making to smoke; including curiosity, self-image with common depictions of appearing *"cool"* and seeming *"bigger"*. These views were also similarly shared with the one occasional smoker. Only one participant stated that they started smoking after their diabetes diagnosis (Table 4).

Most participants reported that their smoking routine was *"regimented"* and their habits were dependent on social activities, personal rituals, work and free time. Being busy deterred their attention away from smoking and reduced the number of cigarettes consumed (Table 4).

Several codes were identified that addressed changes in smoking patterns within the sample itself both among the occasional and regular smokers. Increased health awareness, partner's disapproval of smoking, financial restrictions, parenthood, work environment and diagnosis of diabetes were listed as factors that altered their smoking behaviour (Table 4). As a result, some reduced their cigarette uptake, whilst others changed their smoking location or switched to alternative tobacco-based products that were either cheaper or contained less tar and nicotine. Interestingly, public smoking bans did not discourage some of the participants from their smoking habits and in fact led to the formation of new norms in relation to smoking outside (Table 4).

Nearly all of the participants attempted to quit smoking in their lifetime which was mainly due to health reasons associated with their early diagnosis of diabetes or due to some form of restrictions; such as hospitalisation, finances or inaccessibility to cigarettes (Table 4). Some attempted to quit for personal reasons by hoping to improve their quality of life.

An array of smoking cessation products and services were tried and tested and were mainly NRT-based including patches, lozenges, chewing gum, inhalers and e-cigarettes (Table 4). Although, many reflected that they were not informed on how to use them by healthcare services. A few participants stopped smoking "*cold turkey*" and they may or may have not used additional methods to aid their quitting attempts. Recommendations on choices of NRT were either made through their local GP services or through the Stop Smoking Service at Boots. Other non-evidence based measures used to help quit smoking included hypnosis, Allen Carr's

books on quitting smoking and mints. Nonetheless, despite their efforts to quit nearly all of the participants relapsed and continued to smoke.

Table 4. Key subthemes representing the "*responses*" component of the P<u>R</u>IME theory.

Urges that Influence smoking behaviour

When assessing the views of the study sample towards quitting smoking, a few reported that they were not keen to quit. One informant mentioned that reducing their intake of cigarettes was considered sufficient and did not account them as a regular smoker. Others inferred that they could quit but were not willing to do so during that time as it was not on their mind (Table 5).

Some participants claimed that their addictions and cravings maintained their smoking habits and others smoked as a reward after a strenuous work day, medicinal usage for pain and/or boredom (Table 5). One participant referred to their cigarettes as their *"best friend"* and a source of reliability to cope with their day. Interestingly, less than a half of the studied population could not provide reasoning to continue with their smoking habits.

Participants who used e-cigarettes criticised their effectiveness in quitting smoking as it did not hinder the physical act of smoking (Table 5).

Many participants felt that habits and routines associated with smoking were obstacles to quitting. Temptation to smoke predominantly in social settings was voiced as a common barrier to refrain from smoking (Table 5). Other impediments included lack of social support and dependency on cigarettes to alleviate stress or for emotional support. For others, shame and secrecy about smoking deterred their urge to quit. A few participants mentioned that their health conditions did not encourage them to quit smoking due to other health priorities. In other instances, external forces such as bereavement, depression or troubles with work prompted their relapse to cigarettes as a coping mechanism (Table 5).

Table 5. Key subthemes representing the "*impulses*" component of the PR<u>I</u>ME theory.

Motives to quit smoking

Although the majority of participants attempted to quit smoking in the past, many mentioned that they lacked will power to sustain their quitting attempts (Table 6).

Overall, participants acknowledged that they should not be smoking and were aware of the negative attributes of cigarettes. However, despite their beliefs they continue to smoke (Table 6). Moreover, a few of the participants mentioned that they disliked being a smoker but carried on smoking nonetheless.

Participants who attempted to quit in the past employed a variety of strategies to stop them from relapsing, including engaging in alternative activities that were not associated with smoking; such as cooking or other house chores (Table 6). One participant swapped cigarettes with liquorice to help mimic the act of smoking. Some participants practiced meditation to strengthen their focus on quitting (Table 6).

Provision of educational support from health care professionals was expressed as a potential influential factor to refrain from smoking by some participants. In addition, external cues such as engaging in extra-curricular activities, support from family and friends, and public smoking bans could encourage quitting attempts (Table 6). In addition, adopting a healthful lifestyle and being mindful of goals helped deflect their attention and desire to smoke (Table 6). Eliminating sources of temptation associated with smoking without or with the use of NRT, particularly nicotine patches, helped to lessen the cravings associated with cigarettes and discarded the physical habit associated with smoking (Table 6). One participant would prefer a more "*radical*" approach to instantly stop smoking through a single intervention; such as an injection that triggers a vomiting reflux when they attempt to smoke a cigarette.

Table 6. Key subthemes representing the "*motives*" component of the PRI<u>ME</u> theory.

BEliefs about smoking and smoking cessation strategies

Smoking was seen as an emotional reliever and some reported that smoking offers them alone time to recuperate from their routine activities and responsibilities (Table 7). Smoking was positively attributed to feelings of reward and pleasure. The physiological sensation associated with the tobacco taste and inhalation process was seen as an alluring reason to smoke (Table

7). One informant mentioned that smoking was no longer socially acceptable and perceived as *"not cool"* at the current time; allowing them to reassess their smoking behaviour.

Most informants were conscious of the adverse effects of smoking on general health (Table 7). However, only a few could directly link an association between smoking and diabetes complications; whilst others did not believe that there was any correlation between smoking and diabetes.

The poor awareness of the impact of smoking on diabetes was supported by the fact that only a few participants were informed of the added risks of smoking on diabetes by healthcare professionals, or information given was general and not explicit to their diabetes. Moreover, they were never provided information on the association of smoking and diabetes by their healthcare providers (Table 7).

Those who attempted to quit mostly experienced adverse events with NRTs and their use was seemingly counter-productive to taper the mental effects and physical habits attributed to cigarettes (Table 7). In addition, the ease of use of e-cigarettes and their lessened restrictions in comparison to normal cigarettes allowed them to be smoked more frequently (Table 7).

Table 7. Key subthemes representing the "*evaluations*" component of the PRIM<u>E</u> theory.

Discussion

This study examined the experiences, beliefs and attitudes of smokers with T1D towards smoking and its cessation. The existing empirical evidence on smokers with T1D is outdated and are derived from studies bearing risk of methodological bias including high risk of selection, detection and performance bias. Nonetheless, there is a lack of recent seminal reports providing information on perceptions of smokers with diabetes on smoking and diabetes care. Therefore, the current findings were compared to previous evidence to identify areas of progression within the realm of smoking in the diabetes population, as well as recognising areas that yet warrant immediate attention. The present findings illustrated that various intrinsic and extrinsic factors influence smoking behaviour in people with T1D; particularly self-image and societal norms respectively. Their impulses to continue smoking reflect on the internal addictive cravings and external social pressures. Moreover, the negative outcomes associated with existing smoking cessation approaches hinder their motivation to quit. These individuals

have proposed numerous strategies to enhance quitting attempts; including active engagement from health care services to provide explicit information on the added risks of smoking on their diabetes.

The current study used the PRIME model to identify factors that influence the smoking habits of smokers with T1D and their decision-making to quit. The PRIME model emphasises on *"plans"* to develop strategies that would assist them with the intent of quitting smoking. Quitting smoking was seen as a personal choice among smokers with T1D and this was also perceived by smokers with chronic obstructive pulmonary disease (COPD) with similar references to "*all in your brain*" being echoed by both cohorts when planning to stop smoking (Eklund, Nilsson, Hedman, & Lindberg, 2012). Whilst some would refer to their GP for advice and support to quit smoking, a few preferred to seek help on their own. It is plausible that some individuals may not want to feel patronised by physicians and therefore avoid seeking their support (Eklund et al., 2012). This may be a common concern among smokers with chronic conditions as smokers with T1D have also previously criticised healthcare professionals on their poor demeanour when providing advice on smoking cessation (Padmawati, Ng, Prabandari, & Nichter, 2009).

Most participants attributed their smoking behaviour, *"response"* – another element of PRIME, to external triggers (social influences) and internal cues (self-image). Some of these findings overlap with previous research on adolescent smokers with T1D (Regber & Kelly, 2007). However, no other studies identified self-image as an instigator to smoking in this population. Only one patient proclaimed that their diabetes diagnosis triggered the onset of their smoking behaviour. This notion was never reported in previous research among individuals with T1D; illustrating novel findings that will need to be considered in future work. In addition, smoking was associated with various activities including alcohol consumption. The correlation between tobacco and alcohol intake was previously described among the general population of smokers (Uppal et al., 2013); suggesting that engaging in one activity greatly increases the tendency of an alternate addictive behaviour (Action on Smoking and Health, 2015).

For most, smoking frequency lessened with age due to increased health awareness, diabetes status and changes in their social status. Regber and Kelly (2007) reported similar findings in adolescent T1D smokers. However, their study population did not specify their diabetes condition as a determinant for changes in smoking behaviour.

Whilst self-image was seen as an antecedent to initiate smoking, it was later perceived as a reason to quit due to reform of social norms. The importance of appearance was inferred in previous research (Regber & Kelly, 2007) but changes in societal views on smoking had not been emphasised before. Most participants attempted to stop smoking and their decision to quit was due to several factors including health. This was similarly echoed across elderly patients with diabetes who quit smoking (Banerjee, 1989). Additional reasons to stop smoking included the costly value of cigarettes, which was also mentioned by young patients with T1D and adults with T2D (Chau et al., 2015; Regber & Kelly, 2007). This is not a surprise as tobacco control measures have increased cigarette prices to reduce smoking rates and the impact of tobacco taxation has been successful in reducing smoking prevalence and increasing quitting rates (Wilson et al., 2012).

In previous research, weight and food management were noted as primary reasons to continue smoking, particularly among T2D patients who present comorbidity of obesity along with their condition (Chau et al., 2015; Iglay et al., 2016). Thus, smoking is considered as a means to regulate weight and food intake. However, these concerns have also been expressed by a minority of individuals with T1D (Haire-Joshu, Heady, Thomas, Schechtman, & Fisher, 1994; Rosenfeld, Wakefield, & Roberts, 1997; Wakefield, Roberts, Rosenfeld, 1998). In contrast to previous findings, weight was not a cause for concern within the current study population. It is plausible that the discrepancies between the present and earlier findings might reflect on the age differences between the participants as T1D adolescents are more likely to report concern over shape and weight (Bryden et al. 1999) than that reported by older adults in the present study; suggesting that priorities differ between various age groups.

"*Impulses*" that drive individuals to continue or quit smoking represents another facet of the PRIME model. Addiction and cravings to cigarettes sustained the smoking behaviour of patients with T1D. This compulsion was previously narrated by 50% of adult patients with diabetes who relapsed due to their cravings (Ardron, MacFarlane, Robinson, Heyningen, & Calverley, 1988). The perceived reliability of cigarettes also warranted their continued use and this notion was documented in individuals with and without diabetes (Padmawati et al., 2009; Uppal et al., 2013). In addition, the physical act of smoking was seen as a notable challenge in the quitting process. Altogether, it appears that a combination of internal and external forces mediates an individual's impulses to continue smoking.

The habitual act of smoking, peer pressure and lack of will power were commonly experienced and perceived as barriers during their quit attempts. These issues were also expressed in patients with T2D and the general population (Chau et al., 2015; Uppal et al., 2013). Interestingly, none of the participants mentioned their diabetes as a barrier to quitting, which is in accord to the perception of individuals with T1D from previous exploratory studies (Haire-Joshu et al., 1994; Rosenfeld et al., 1997).

Overall, most smokers with T1D within this sample claimed that they were not motivated give up smoking. Although some showed cognitive dissonance towards smoking, their lack of *"motivation"* superseded their need to quit; addressing the fourth aspect of the PRIME paradigm. Their desire to quit was not compelling enough to do so, despite their beliefs on the lack of health benefits of smoking. Therefore, higher levels within the motivational framework will need to be addressed that focus on beliefs and intentions, which would ultimately influence their motives and subsequent actions.

Most participants were in support of being informed on the associative risks of smoking on their diabetes, which may in part help re-evaluate their views on smoking. Several believe that smoking worsens their diabetes symptoms; whilst a few of the study population believe that smoking and diabetes are two separate entities and not interlinked. To date, no studies have addressed enhancing education uptake on smoking cessation for patients with diabetes, and assessing whether increased knowledge would improve their self-efficacy. Two previous studies report the need for tailored educational programmes on smoking cessation for people with diabetes and the need to improve care delivery by health professionals (Uppal et al., 2013; Rosenfeld et al., 1997).

Social support was voiced as a probing factor to encourage smoking cessation in people with T1D and these views were similarly shared by smokers with T2D whereby family support increased their quitting attempts (Chau et al., 2015); suggesting that family or peer interventions may elicit higher quitting success. For some, public smoking bans elicited positive changes in smoking behaviour in some participants, by reducing their intake of cigarettes. These responses were similarly observed in a time trend analysis assessing the effect of a smoking ban policy on tobacco consumption and smoking prevalence in Italy (Gualano et al., 2014). Although, a Cochrane review of 24 studies illustrated that the evidence on the impact of legislative smoking bans is inconsistent, with some studies showing no changes in smoking prevalence (Frazer et al., 2016). Discrepancies in smoking outcomes and the effectiveness of

smoking bans may be confounded by the implementation of prior tobacco control policies, the extent of public support and level of enforcement (Wilson et al., 2012).

According to PRIME, an individual's *"evaluations"* inform their motives and intentions to plan a certain course of behaviour (West, 2006). This view represents another component of the addiction model. Throughout the literature, it is apparent that people with diabetes are aware of the general health risks of smoking. However, their knowledge of the direct link between smoking and their diabetes is limited (Padmawati et al., 2009; Rosenfeld et al., 1997; Wakefield et al., 1998). Moreover, individuals with T1D do not believe that smoking exacerbates their diabetes condition as most report that their diabetes symptoms are controlled. The reported poor awareness in the associative link between smoking and diabetes was partly attributed to minimal engagement by health care providers. This was also reported elsewhere in prior studies, illustrating limited support from clinicians encouraging appropriate behaviour changes to quitting smoking (Padmawati et al., 2009; Solberg, Desai, O'Connor, Bishop, & Devlin, 2004; Rosenfeld et al., 1997; Wakefield et al., 1998). Involvement of health services could improve quitting attempts in people with T1D by enhancing their uptake of smoking cessation.

Most smokers who used NRT claimed that they were ineffective in seizing both the physical and mental habitual cravings associated with smoking. The suitability of NRT has been questioned in the past, particularly since their use has not been explained to patients seeking to quit. This concern was previously raised by individuals with diabetes (Gill, Morgan, & MacFarlane, 2005; Rosenfeld et al., 1997) and non-diabetes as well (Uppal et al., 2013). The limited education and knowledge on the associative risks of smoking on diabetes have been previously mentioned and were partially attributed to minimal health care support (Padmawati et al., 2009) and lack of structured educational programmes on smoking cessation (Grant, Haq, & Barnes, 2012). Smokers with COPD shared similar views reporting that they were uncertain about the relationship between smoking and their condition (van Eerd, Risor, van Rossem, van Schayck, & Kotz, 2015). Moreover, smokers with COPD were not informed on the hazards of smoking on their respiratory health (van Eerd et al., 2015). Thus, smoking cessation services should provide explicit information about their products to validate the suitability and effectiveness of these approaches to individuals with chronic conditions.

Study limitations

This study allowed in-depth exploration into the experiences of smokers with T1D, unravelling meanings behind those experiences and yielding richness in data. One limitation of the study included phone interviews resulting in loss of nonverbal information, which may affect the contextual interpretation of responses. However, to minimise researcher bias and increase validity of the current findings, investigator triangulation was accomplished by two authors carrying out independent analyses simultaneously. Results were then compared and reviewed to develop more broad understanding of the studied phenomenon based on each of the investigator's perspective. Differences in data interpretation were resolved through consensus. The different interviewing medium employed may affect the data quality and level of insight obtained. However, previous research notes suggest that data quality is not compromised when using either telephone, Skype or face-to-face interviewing. Offering choices on preferred communication platforms provides benefits to both the researcher and interviewer (Hanna, 2012; Sturges & Hanrahan, 2004). In the current study, there was no overt difference in the depth of insight gained through the different modes of interviewing. Nonetheless, future studies should explore the impact of different interviewing platforms on the quality of interview data or level of insight sought to determine the most optimal interviewing method in qualitative research. Another limitation was that the small sample size of the studied population may not be representative of all smokers with T1D. Only one participant was identified as an occasional smoker and their smoking and quitting experiences were similar to that of current regular smokers; suggesting that factors other than nicotine dependence may have a more profound influence on the smoking behaviour of both regular and occasional smokers. Although, this notion would need to be verified with a larger cohort of occasional smokers.

Conclusion

Quitting smoking among people with T1D is a challenging process faced by internal and external barriers. Whilst ample services and products for smoking cessation do exist, many criticized their usefulness and reported several adverse events. Moreover, limited knowledge about the effects of smoking on diabetes and limited support from health care providers appears to dissuade them from stopping smoking. Future studies should focus on developing multi-modal smoking cessation interventions that encompass educational and behavioural support,

along with pharmacotherapy to control the psychological and physical addictions associated with tobacco consumption.

Relevance to clinical practice

This study identified knowledge gaps that hinder successful opportunities for patients with T1D to quit smoking. These individuals experience various challenges during the quitting process in which existing smoking cessation strategies do not support. Increasing the number of quit attempts and enhancing the success rate of attempted quitters can be achieved by:

- Ensuring that physicians and nurses assess the smoking profile of patients by documenting smoking status at annual reviews.

- Providing clear advice to all patients who smoke to stop the habit. This should be personalised and linked to their diabetes.

- Providing referrals to smoking cessation services and follow ups within 4-weeks' time frame.

- Improving accessibility to pharmacotherapy and behavioural support for those who do not wish to be referred to smoking cessation services by providing information leaflets on different products and auditing secondary care patient records for successful quitting attempts.

Future qualitative studies should identify potential barriers and facilitators affecting the delivery of smoking cessation support by diabetes clinicians which could inform the development of training programmes to enhance staff education on the associative risks of smoking and diabetes, as well as providing information on the use of NRT. This could empower health care providers to deliver high quality patient care and encourage smoking cessation interventions that are appropriate for patients with chronic conditions.
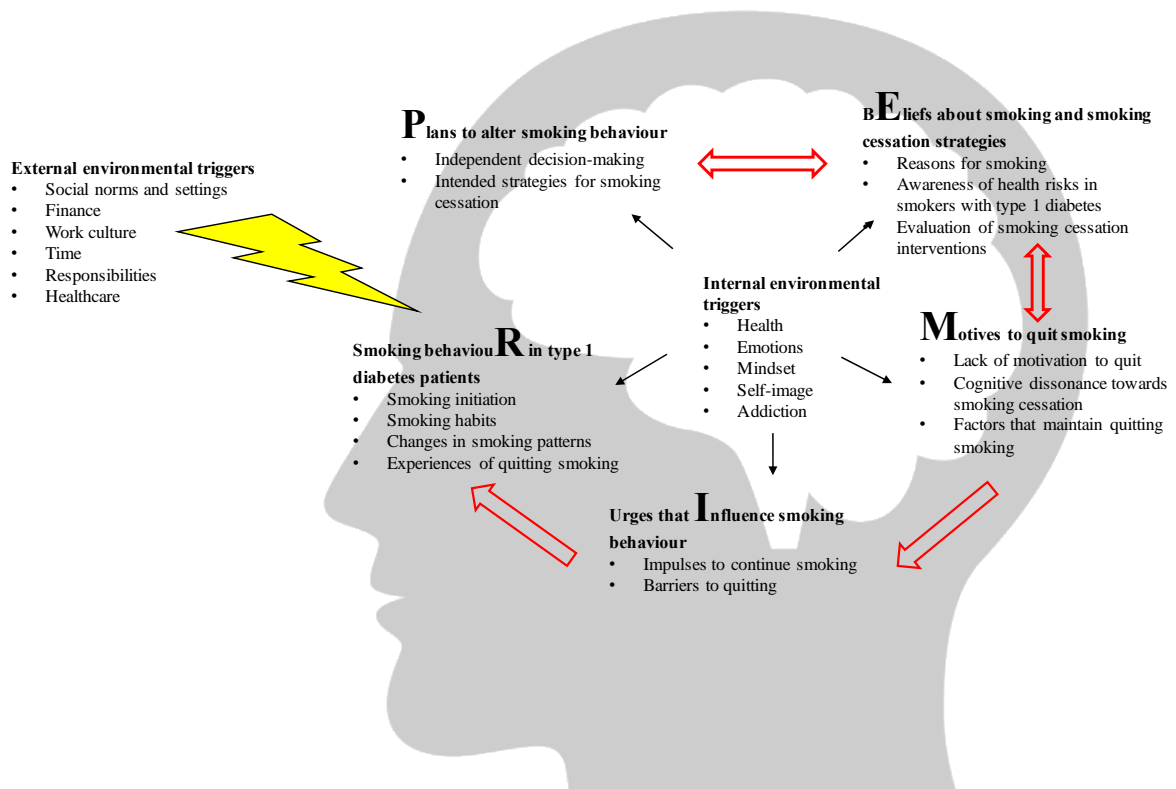
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Figure 1. Emergent themes and subthemes in accordance to the PRIME theory

Opening question	Describe your smoking history. When did you first smoke? Why did you first start smoking? How much do you smoke? Are there any changes in your smoking pattern? If so, what are the reasons?
Medical history of diabetes	How did you feel when you were first diagnosed with diabetes? How do you manage it? How does diabetes impact your lifestyle and what are the challenges that you face?
Beliefs about smoking	Are you satisfied with your current health? Do you think smoking has affected your diabetes in any way? Why do you think you continue to smoke? In your opinion, what are the perceived benefits of smoking?
Plans to continue or quit smoking	Have you ever attempted to quit smoking? **If yes**, tell me about your quit attempt. What motivated you to quit? How did you distract yourself when you were feeling like having a cigarette? What did you find difficult when quitting smoking? **If no**, then what factors prevented you from quitting smoking? If you decided to quit smoking, how would you distract yourself if you felt like having a cigarette? What factors would influence your decision to stop smoking?
Barriers to quitting	Were there times when you wanted to give up quitting smoking? **Yes** = what did you do to carry on quitting? **No** = how did you stay focused to quitting? What would be the main reasons for you to continue to smoke or relapse? Did other people make it difficult for you to quit? **Yes** = who and how? **No** = explain
Perception of existing smoking cessation policies and services	What services have you explored to quit smoking? What methods of quitting have or have not worked for you in the past and why? Have you ever received advice?
Closing question	Have there been any external factors that have influenced your smoking behaviour? Explain.

Table 1. Topic guide for semi-structured interviews

Characteristics	Frequency	Percentage
Demographics		
Mean age (S.D.)	33.7 ± 13.3	
Sex		
Male	8	66.7
Female	4	33.3
Marital status		
Single	7	58.3
Married/Common-law	4	33.3
Widowed/Separated/Divorced	1	8.3
Education level		
Secondary	4	33.3
Postsecondary/tertiary	8	66.7
Ethnicity (white)	12	100
Employment status		
Employed	10	83.3
Unemployed	2	16.7
Diabetes Profile		
Mean age at diagnosis (S.D.)	17.9 ± 15.1	
Duration of diabetes in years (S.D.)	15.7 ± 10.2	
Diabetes treatment		
Multiple daily injections	8	66.7
Twice daily insulin	1	8.3
Insulin pump	3	25
Smoking Profile		
Smoked 100 cigarettes in lifetime	12	100
Mean number of cigarettes/day (S.D.)	8.2 ± 5.4	
Time to first cigarette		
Morning	7	58.3
Afternoon	2	16.7
Evening	2	16.7
Other	1	8.3
Quitting attempts	11	91.7

Table 2. Characteristics of smokers with T1D

Plans to alter smoking behaviour

Subthemes	Quote
Independent decision-making	*"I think, for me, it's….no-one can help you. It's like it's all in your brain and mind. It's all up to you."* (Male P7, age 27)
Intended strategies for smoking cessation	
Support system	[Asked where they would go for advice for quitting smoking] *"My doctor, I think."* (Female P1, age 25)
Home restrictions	*"We're trying not to smoke at home because I never smoke cigarettes in the house."* (Male P8, age 35)
Conditional rules	*"While I don't have money, I won't smoke."* (Male P7, age 27)
Setting goals	*"If I manage to smoke one less a day than I did last, that's a step forward."* (Male P11, age 31)

Table 3. Key subthemes representing the "*plans*" component of the <u>P</u>RIME theory.

Smoking behaviou**R** in type 1 diabetes patients

Subthemes	Quote
Smoking initiation	
Social acceptability	*"I was very young and wanted to be like everyone else."* (Female P5, age 52)
Self-image	*"Just thought I'm being very grown-up and cool by having cigarette in my mouth."* (Male P8, age 35)
Diabetes diagnosis	*"It was after I got diagnosed with diabetes that I started smoking."* (Male P3, age 33)
Smoking habits	
Routine	*"I will say when I'm drinking, which is sociable, you know, I do enjoy a cigarette."* (Female P5, age 52)
Time limitations	*"If I've got lots to do and I'm distracted, I'll only have one break."* (Female P13, age 29)
Changes in smoking pattern	
External influences	*"So I think I did kind of cut down once I started working."* (Male P3, age 33)
Health awareness	*"I think since then I probably smoke between 10 and 20 cigarettes a day until I got diagnosed with diabetes; then I tried to cut down."* (Male P8, age 35)
Adoption of new norms	*"When the cigarette ban came in, then that was very social to go – to leave the bar and stand outside and smoke a cigarette and spend half the night outside, actually smoking cigarettes, rather than dancing like everyone else was, and I'm thinking, this is so cool. This is the new social thing, this smoking outside."* (Male P8, age 35)
Experiences of quitting smoking	
Reasons to quit smoking	*I did (stop smoking) when I was diagnosed diabetic, so I did for a couple of months."* (Female P9, age 48)
Strategies used to quit smoking	*"When I have tried to stop smoking I've done it through Stop Smoking Service at like Boots Pharmacy and because I'm diabetic I can actually get the lozenges and patches and so on free of charge so that obviously helps."* (Male P12, age 35)

Table 4. Key subthemes representing the "*responses*" component of the P<u>R</u>IME theory.

Urges that Influence smoking behaviour

Subthemes	Quote
Impulses to continue smoking	
Attitude towards smoking cessation	*"I don't have it (quitting) in my mind, so I'm OK with smoking"* (Male P7, age 27)
Non-smoker identity	*"You're on 2 cigarettes a day, you're not really smoking."* (Male P2, age 50)
Barriers to quitting	
Cravings	*"I think it's just that – it's the fear of – it's like your best friend. It's something you're addicted to, something that makes you feel better, even though you know that it only makes you feel better because moments ago you were feeling worse, 'cause you had the craving."* (Female P13, age 29)
Reliability of cigarettes	*"Because it's very reliable, the cigarette's always there for you, it's always going to have the same effect."* (Male P11, age 31)
Addiction to the physical act of smoking	*"I don't think smoking an e-cigarette is a good way to try and give up smoking cause kind of you're still doing the action."* (Male, P3, age 33)
Associative cues	*"When I went out and I was having a drink, a cigarette was a must."* (Male P8, age 35)
Lack of support	*"The reason I had a cigarette was because she was smoking, I had a bad day, and I just said, Oh, I've had a bad day. Can I pinch a cigarette?"* (Female P13, age 29)
Secrecy	*"I think external factors maybe my parents, with them not knowing that I smoke, influenced in terms of being able to chain smoke so easily.* (Female P13, age 29)
Prioritising health conditions	*"I guess I just I feel like there's so much kind of going on right now um with like my mental health and this that and the other that I'm just kind of like do you know what I'll just cross that bridge when I come to it."* (Female P1, age 25)
Unfortunate circumstances	*"I've kind of been in and out of work through lapses of depression, so I think that's been part of it."* (Male P12, age 35)

Table 5. Key subthemes representing the *"impulses"* component of the PRIME theory.

Motives to quit smoking

Subthemes	Quote
Lack of motivation to quit	*"Just lack of commitment and willpower."* (Male P11, age 31)
Cognitive dissonance towards smoking cessation	*"Even as a non-diabetic who smokes, you know what the risks are. You know, heart disease, lung cancer, nerve damage – just, you know, all of the horrible things that come with it, but people still do it anyway."* (Female P13, age 29)
Factors that maintain quitting smoking	
Physical distractions	*"Find something in the house to do, whether it be cook, wash clothes."* (Female P5, age 52)
Meditation	*"I just keep telling yourself, just keep calm. Keep calm. The craving's going to go in five minutes and you'll be fine again."* (Male P8, age 35)
Provision of educational support	*"I think if someone explained to me how diabetes and smoking's linked and how it's not is it even good for you I know smoking's not good for you anyway but if it was affecting the diabetes then if somebody explained how that's working then yeah I probably would give up anyway of my own accord."* (Male P10, age 39)
Peer support	*"A friend of mine, he stopped smoking and stopped drinking alongside with me, it was kind of a deal that we went into together."* (Male P11, age 31)
Public smoking bans	*"Not being able to smoke inside pubs and venues and so on obviously cuts down the amount that you smoke when you go out."* (Male P12, age 35)
Healthy lifestyle	*"I got really healthy and fit and kind of realised that I didn't need to smoke."* (Male P12, age 35)
Breaking the habit	*"I think that (nicotine patches) definitely helps take the craving away and then I think it's the kind of...it's the breaking the habit."* (Male P3, age 33)

Table 6. Key subthemes representing the "*motives*" component of the PR<u>IM</u>E theory.

B**E**liefs about smoking and smoking cessation

Subthemes	Quote
Reasons for smoking	
Emotional support	*"I still feel like it's kind of a stress relief type thing. It does make me feel more relaxed."* (Male P3, age 33)
Alone time	*"Just three or four minutes that no-one can interrupt you with, you go round the back of the building, that's smoker's corner, don't interrupt me."* (Male P11, age 31)
Enjoyment	*"I think it (smoking) is association with pleasure."* (Female P9, age 48)
Awareness of health risks in T1D smokers	
Lack of knowledge	*"Well, because I'm Type 1 diabetic, then I don't think it (smoking) would impact on me."* (Female P13, age 29)
Limited support from health care providers	*[Asked about whether they were informed if there was a link between smoking and diabetes] …. "They said it's not good."* (Male P10, age 39)
Evaluation of smoking cessation interventions	
Negative experiences using NRT	*"I didn't realize was that it (nicotine patch) was releasing nicotine 24 hours a day. So course you couldn't get to sleep…. So I then tried using a lower dose and then taking the patch off before I went to bed or photo film but again it was...it kind of irritated my skin."* (Male P2, age 50)
Problems with countering the habitual acts of smoking	*"I tried the inhalers and e-cigarettes, but I didn't feel like this is actually helping me because I still have the habit of I'm doing something."* (Male P8, age 35)
Ineffectiveness of e-cigarettes	*"I think the e-cigarette thing is I'm not convinced that they're any healthier than normal cigarettes…. I think with e-cigarettes I would end up smoking them more probably than I would lighting up a normal cigarette just because of the kind of ease and being able to smoke them in more places than a normal cigarette."* (Male P12, age 35)

Table 7. Key subthemes representing the "*evaluations*" component of the PRIM<u>E</u> theory.