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'Feta is obviously very dangerous stuff looking at all those reds': Can nutrition labelling help people living with type 2 diabetes to self-manage their condition?

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Abstract

Background: The consumption of a healthy balanced diet is the cornerstone of treatment for people living with type 2 diabetes (PLWT2DM). The United Kingdom recommends a standardised voluntary front-of-pack food labelling system which uses the green–amber–red colour coding to indicate the presence of nutrients in a food item. Research with PLWT2DM suggests that they may find it challenging to interpret the information on food labels. This paper draws from a larger study exploring nutrition information practices for PLWT2DM. The aim of this paper is to explore the experiences of using nutrition information found on food labels among PLWT2DM and their partners/carers.

Methods: This study used a qualitative and mixed methods design, using a solicited 4-week unstructured diary followed by a qualitative interview with each participant. The theoretical framework drew on practice theory. Data were analysed using thematic analysis.

Results: Nineteen PLWT2DM and one partner took part. Data consisted of 19 diaries and interviews. Almost all participants used food labels to help manage their condition; however, the colour-coding link with traffic lights appeared to overemphasise the need to avoid foods with red labels. Participants' beliefs about sugar influenced their food choices which in turn could impact on their nutritional intake. Highly developed mathematical skills were needed to interpret information about portion sizes.

Conclusions: Healthcare professionals and patient support groups should focus more on educating PLWT2DM about how to interpret food labels so that they are able to apply these to their own food choices. Future research and development of subsequent versions of the food labelling system should include PLWT2DM to ensure that labels are both clear and relevant to them.

KEYWORDS

food labels, nutrition information, qualitative research, traffic light system, type 2 diabetes

Key points

- The use of food labels is embedded into the everyday information practice of people living with type 2 diabetes (PLWT2DM) and has the potential to assist in making healthy food choices.

- The need for high-level maths skills, beliefs about nutrients such as sugar and the embodied link between red and danger may impact on the usability of food labels potentially leading to the avoidance foods that have positive health properties for PLWT2DM.
- Healthcare professionals and patient organisations should ensure that time is given to educating PLWT2DM on how to apply the information on food labels to their own daily food choices.
- Further research is needed with PLWT2DM to ensure that information of food packaging is useful to them in their self-management.

BACKGROUND

The consumption of a healthy diet and adequate physical activity are the cornerstones of treatment for people living with type 2 diabetes (PLWT2DM). The guidance about what constitutes a healthy diet for PLWT2DM is wide ranging,[1] and living with T2DM requires daily decisions about what to eat.[2] Although Diabetes UK Nutrition Working Group[1] explains that it is important for information and advice to enable an individual's ongoing enjoyment of food, Diabetes UK[3] website states 'it can be stressful knowing what's best…'.

PLWT2DM access information from a wide range of sources to help them make decisions about self-management.[4,5] However, information is often complicated and can be overwhelming, conflicting and difficult to understand.[6] Research with PLWT2DM suggests that they may face challenges particularly in integrating the complex topic of the role of carbohydrate in managing their T2DM.[7,8]

In the United Kingdom, nutrition food labelling includes the front-of-pack (FOP) nutrition labelling and nutritional claims, which are voluntary, and the back-of-pack (BOP) nutrition information, which is currently mandatory.[9] At the time of the study, the United Kingdom followed the European Union (EU) Regulation No 1169/2011[10] on the provision of food information to consumers. The FOP nutrition labelling approach is seen by the World Health Organization (WHO) as a key component of public health nutrition in enabling decisions about which food is healthier to eat to prevent and manage diet-related noncommunicable diseases.[11] If food manufacturers selling food in the United Kingdom choose to use the FOP nutrition labelling system, they must use the colour-coding system often referred to as the 'traffic light colours'[12–15] and follow the Department of Health and Social Care[9] guidelines. In this system, red denotes a high (unhealthy), amber a medium (neither healthy nor unhealthy) and green a low (healthy) amount of a nutrient. At the time of data collection for this study, along with the inclusion of FOP labelling, the use of the colour-coding system on FOP nutrition labelling was also voluntary. Foods using the FOP labelling displayed either the traffic light system or the 'Guideline Daily Amounts'.[16] The mandatory BOP nutrition information includes the energy value and the amount per 100 g of fat, saturated fat, carbohydrate, sugars, protein and salt.[9] In addition, the manufacturers may voluntarily choose to include the amount of mono-unsaturates, polyunsaturates, polyols, starch, fibre and relevant vitamins and minerals.

There is a variation in guidance using FOP food labels in nutrition information for PLWT2DM. For example, Diabetes UK[17] cites its value for people living with diabetes, calling for them to become mandatory and advising on choosing foods with green labels more often and foods with red labels less often[14]; the InDependent Diabetes Trust advises checking the labels on packaged food to be able to choose foods lower in fat, salt and sugars[18]; Diabetes.co.uk[19] and the X-PERT Diabetes Prevention and Management Programme[20] advise against using FOP labels; and Diabetes UK Nutrition Working Group[1] and nutrition information leaflets for use by dietitians with PLWT2DM do not refer to the use of FOP labels.[21] This variation in guidance for PLWT2DM may add to the challenges when using food labels to make daily decisions about what to eat. The lack of guidance for professionals on how to advise PLWT2DM on using food labels may also add to this.

There is conflicting research evidence on the use and value of food labels for the general population and their value to PLWT2DM. The systematic review undertaken by Croker et al.[22] found that food labels can encourage healthier food purchasing; however, a narrative review undertaken by Temple[23] identified just a 'small degree' of success in the impact that food labels have on food choice. Although research suggests that people with diabetes frequently use food labels[24] and that food label use is higher among those with diabetes[25] than the general population, there is limited recent research undertaken in the United Kingdom about the use of food labelling with PLWT2DM. However, research with PLWT2DM undertaken in other countries suggests that due to a lack of knowledge and understanding, PLWT2DM may not be able to make the most of information that food labels provide or to use these to manage their condition.[24–28]

Research also suggests that the use of food labels to indicate the amount and quality of carbohydrate is difficult. This may, in part, be because of the challenges

in being able to label the amount of free sugars (added sugars and sugars in fruit juices) and natural sugars (such as those in whole fruit, milk and yogurt) as opposed to total sugars.[24] Although all carbohydrates raise blood sugar levels, PLWT2DM may not have the knowledge and skills to be able to distinguish foods with healthy carbohydrates from those with high levels of free sugars[7,25] or highly processed foods that are low in sugar.[26] Also, they may not be able to undertake calculations using the BOP nutrition information to identify how much carbohydrate there is in a particular food.[27]

The limited research specifically focusing on PLWT2DM, along with the challenges identified by research and charitable organisations supporting PLWT2DM using food labels, suggests that further research is needed in this area. This study was part of a larger study undertaken as part of a doctoral programme of work,[29] and the overall aim of the study was to investigate nutrition information practices undertaken by PLWT2DM and their partners/carers. The aim of this paper was to explore the experiences of accessing and using nutrition information found on FOP food labels among PLWT2DM and their partners/carers. The research question was 'what food label information do PLWT2DM and their partners/carers need and use and how is the information acquired?' The aim and research question focusing on everyday practices suggested the use of a qualitative approach.[30]

METHODS

The study utilised a broadly social constructionist approach using qualitative mixed methods incorporating the diary-interview approach.[31–33] The method aimed to facilitate participants to record their everyday activities without the influence of the researcher (the lead author) and enabled the researcher to gain a deeper understanding of the diary entries during an interview.[34,35] The development of the method has been discussed further by McClinchy et al.[4]

The theoretical framework utilised for this study was practice theory, described as the 'embodied, materially interwoven practices centrally organised around shared practical understandings'.[36,37] Everyday practices are based on the connections between the three components of practice theory: materials, meanings and competencies.[38] Materials are tangible entities and include information artefacts, in this study the food labels themselves. Meanings and beliefs refer to symbolic meanings, ideas, aspirations, dispositions and preferences. Competencies are the skills and knowledge needed to undertake the practice.[38]

The diary-interview approach utilised was developed for this study through piloting with PLWT2DM who were lay members of the university's public involvement in research group, or who were partners or carers of PLWT2DM. Following piloting, a diary pack designed to be kept for 4 weeks was developed. This included an A5 notebook with diary completion instructions, pens, pencils, a disposable camera and a glue stick. The instructions asked participants to consider on each day the type and source of information they came across, whether they were able to use the information and how they came across the information (i.e., active searching or just by chance). The pilot also included the development of an interview topic guide which started with general ice breaker questions about shopping for food, followed by reflections on the diary entries, the diary process, nutrition information in general and suggestions for improvement in how nutrition information is made available. The interview finished with the collection of personal details relating to age and diabetes management.

PLWT2DM and their partners/carers were recruited using the snowball approach primarily from support groups that were advertised on the Diabetes UK website and from the lead author's workplace. Participants were asked to keep an unstructured diary for 4 weeks. This was followed by a face-to-face qualitative interview lasting approximately one hour. The lead author reviewed participants' diaries and annotated the interview topic guide for each participant prior to the interview where questions focused on the expansion and clarification of diary entries. Interviews were recorded, transcribed verbatim and anonymised. Diaries were scanned into PDF, anonymised and transcribed into word. Participant pseudonyms were applied at this point. Transcribed interviews, diary PDFs and their transcriptions were imported into NVIVO 12 (QSR International) which was used to assist in data management.

Thematic analysis was selected as this gave the flexibility to analyse the data at an individual level, as well as across data sources.[39,40] A constant comparison approach was used between an individual's diary and interview and between participants.[1,5,39] The process focused on the key aspects of thematic analysis of familiarisation, coding, use of memos and development of themes. Familiarisation involved listening to audio recordings of interviews and reading printouts of transcribed interviews and diary facsimiles. Ideas, thoughts and links were handwritten on the printouts alongside highlighted text and sticky notes. These notes were used to develop the codes in NVIVO 12. Memos written for each code were used to develop categories and themes. Samples of diaries, interviews and codebooks were discussed among the co-authors during and after the data collection period. Themes were constantly compared with the original data and were discussed critically and agreed with the co-authors.

Ethics approval was obtained from the University of Hertfordshire Health and Human Sciences Ethics

Committee, protocol no. aLMS/PG/UH/00099. Written informed consent was obtained and was confirmed verbally at the start of the interview.

RESULTS

Twenty participants recruited from two counties in the east of England took part in the study. Fifteen were recruited from support groups advertised on the Diabetes UK website, four from Diabetes UK support group newsletters and one from the lead author's workplace. Nineteen participants were living with type 2 diabetes (6 male and 13 female) and one partner (female, Danielle) did not have diabetes. The age range of the participants was 52–84 years, length of time since diagnosis from 0.5 to 23 years with 10 (53%) out of the 19 PLWT2DM being on medication to manage their diabetes. Data consisted of 19 diaries and interviews. One couple Matthew and Naomi were both living with T2DM and chose to submit a joint diary and to be interviewed together. The participants and recruitment are further discussed in McClinchy et al. (Table 1).

All diaries included handwritten entries, and most (n = 17) included samples or photos of information participants had come across, such as food labels from packets of food, newspapers and magazine articles. Most information was pasted into the diary; however, Andrew, Oscar and William provided the lead author with samples of information separately, and Edward, Yvonne and Penelope emailed with examples of information. Diary entries were in the form of detailed reflections (n = 13), analytical accounts (n = 3) and daily log (n = 3) of nutrition information. The number of diary entry days ranged from 5 to 85 days with a median of 14 (William kept his diary for 12 weeks). Interviews lasting approximately one hour were held at the convenience of the participants (between 1 and 21 weeks after diary return)

TABLE 1 Study participants.

Pseudonym	Gender	Age range in years at interview	Time since diagnosis in years	On medication for diabetes	Personal relationships
Andrew	Male	70–74	23	Yes	
Christopher	Male	65–69	7	Yes (insulin)	Married to Danielle
Danielle	Female	65–69	N/A[a]	N/A	Married to Christopher
Edward	Male	75–79	5	No	
Frances	Female	55–59	0.5	Yes	
Gary	Male	60–64	7	Yes	
Helen	Female	70–74	2	No	
Isobel	Female	55–59	21	No	
Jennifer	Female	65–69	0.5	No	
Lisa	Female	50–54	1	No	
Matthew	Male	65–69	5	Yes	Married to Naomi[b]
Naomi	Female	70–75	11	Yes (Insulin)	Married to Matthew[b]
Oscar	Male	55–59	1.5	No	
Penelope	Female	70–74	15	Yes	
Ruth	Female	55–59	1	No	
Susan	Female	60–64	12	Yes	
Theresa	Female	50–54	1	Yes	
Victoria	Female	50–54	7	No	
William	Male	80–84	20	Yes (Insulin)	
Yvonne	Female	76–79	10	No	
	Total 6 male, 13 female	Average 65	Average 8	Total 10 on medication	

[a]Danielle did not have diabetes.

[b]Matthew and Naomi submitted a joint diary and were interviewed together.

in participants' own homes (n = 7), in the participants' workplace (n = 1) or in a café that was convenient for the participant (n = 11).

Food labels as an embodied information practice

Food labels were referred to in 17 out of 19 diaries. Participants included examples of food labels and referred to their use in self-managing their diabetes in a way that suggested using these was a common every day, tacit and assumed self-management tool.

Ruth included checking food labels as one of several daily activities that she had used to successfully further improve her blood glucose readings noted in her diary entry (Figure 1).

Helen included a magazine cutting in her diary that emphasised the importance of reading food labels, which she annotated suggesting that she would look at food labels more frequently as this would help her manage her T2DM (Figure 2).

However, not all participants used food labels to manage their diet. Edward explained that food labels were not something he came across on a regular basis as he mainly cooked his food from scratch. He did not use processed foods and so did not see nutrition information on food labels. He said:

> I don't tend to look at the food labels… I don't really buy processed food so in terms of vegetables you don't really see those food labels, it tends to be on processed food'. (Edward interview)

Food labels for most participants were a source of nutrition information that they used regularly and automatically. The inclusion in the diaries of food labels from foods that they had consumed suggests that their use was embedded in their everyday self-management and information practices.

Beliefs about sugar as a nutrient and ingredient

Sugar was the nutrient and ingredient most commonly reviewed on food labels. It was considered 'bad for everybody' (Danielle) and so needed to be avoided. For example, Theresa explained that when checking the FOP food label she found that a food that she thought would not be was high in sugar. She said:

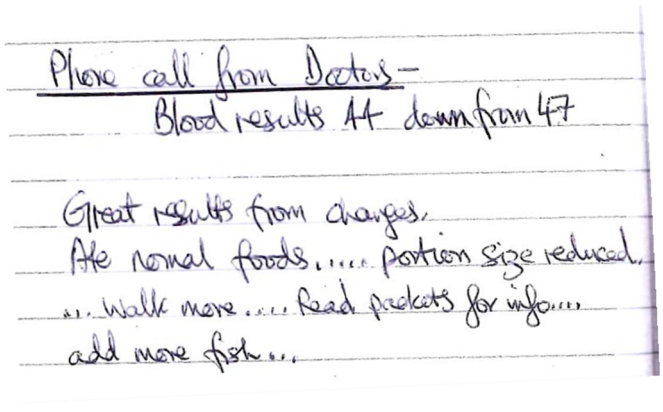
> So I picked them up thinking, 'Oh, it's just curry powder and beans', and put them in the shopping, so it wasn't until I got home that I realised it's not quite what it says, is it?'. (Theresa interview)

Susan who described being 'shocked' at the amount of sugar in bread then examined the amount of sugar in other foods that she ate such as milks, crackers and breakfast cereals. She was also surprised about how much sugar there was in the milk that she used. She decided to examine the sugar value in her usual milk and compared it with others and so identified almond milk as being more appropriate despite it having a lower protein content (see below in Figure 3).

Sugar was considered an ingredient to be avoided as it was felt to be considered harmful and dangerous even if the amount of sugar in a food item was insignificant. If it could be seen on the list of ingredients participants would look for lower sugar versions despite the impact that this might have on other nutrients consumed.

Food labels require complex decision making

Participants used their embodied knowledge and skills to interpret food labels. However, they felt they lacked the competencies and skills to understand them. Participants commented on the clarity of the system with the use of colours making it easier for people to understand whether a food was healthy to eat or not without having to use



Phone call from Doctors

Blood results 44 down from 47

Great results from changes

Ate normal foods.....portion size reduced.

...Walk more....read packets for info....

Add more fish...

FIGURE 1 Ruth diary entry referring to food labels as part of her daily diabetes self-management. Left: diary facsimile; right: diary transcript.

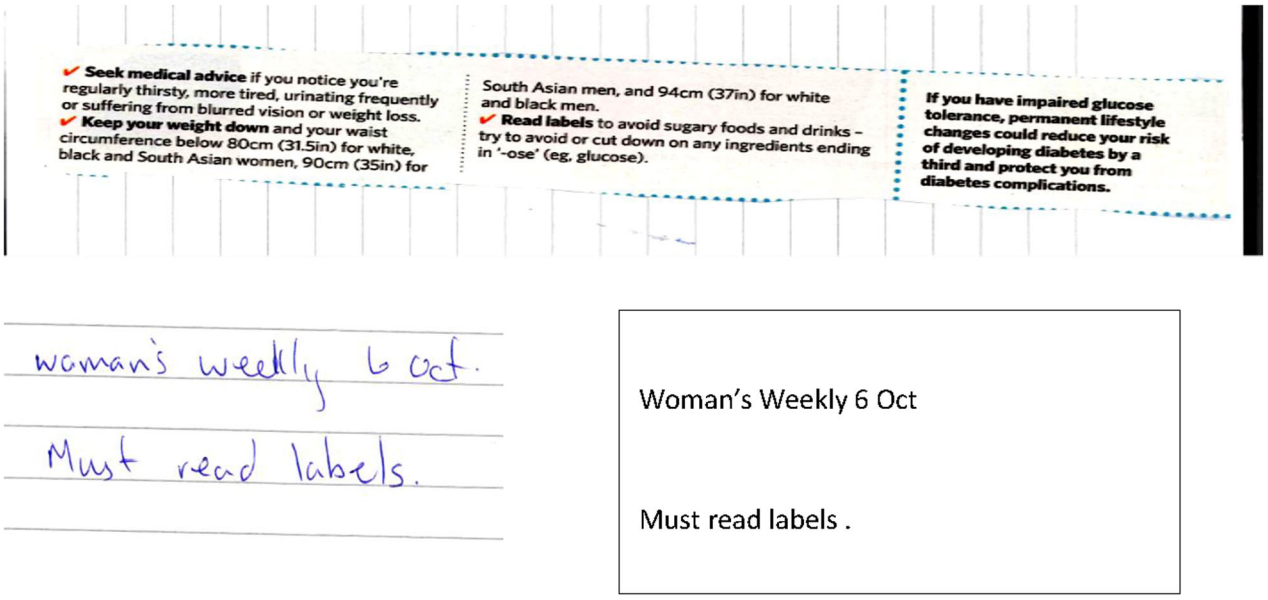


FIGURE 2 Helen diary illustrating the assumed value of using food labels to manage her diabetes. Top and bottom left: diary facsimile; right: diary transcript.

mathematical skills. For example, Victoria said 'for people who are not mathematic or understand percentages [the traffic light system] is really good'. However, Andrew, Francis, Lisa and Theresa felt that there would be challenges in interpreting the figures on food labels. Lisa felt that advanced mathematical skills would be needed to be able to interpret the nutritional value in a portion of food. She described herself as 'being reasonably comfortable with maths' and felt that it would be 'quite difficult for people' to do this detailed analysis. She decided to review the amount of fat, carbohydrate and sugar in a slice of cake that she was having one evening (Figure 4).

Although the clarity of the FOP traffic light system was generally found to be sufficient, this did not always mean that it was easily applicable to everyday decisions about what to eat. Participants began to wonder whether the information on food labels helped them to manage their T2DM. For example, Theresa wrote in her diary 'must say reading all these labels you can see why people don't bother, its just so confusing!!'. Jennifer explained that although she found the traffic light system useful, it did not help her make daily decisions about food. In her interview she said:

> I find the traffic light system on the food that I do buy or have a look at, I find that quite good, very useful. I still don't know what I'm doing mind you! (Jennifer interview)

However, she had made several entries in her diary indicating her expectation that food labels would be able to help her make food choices and yet finding them difficult to apply to her daily decision-making (Figure 5).

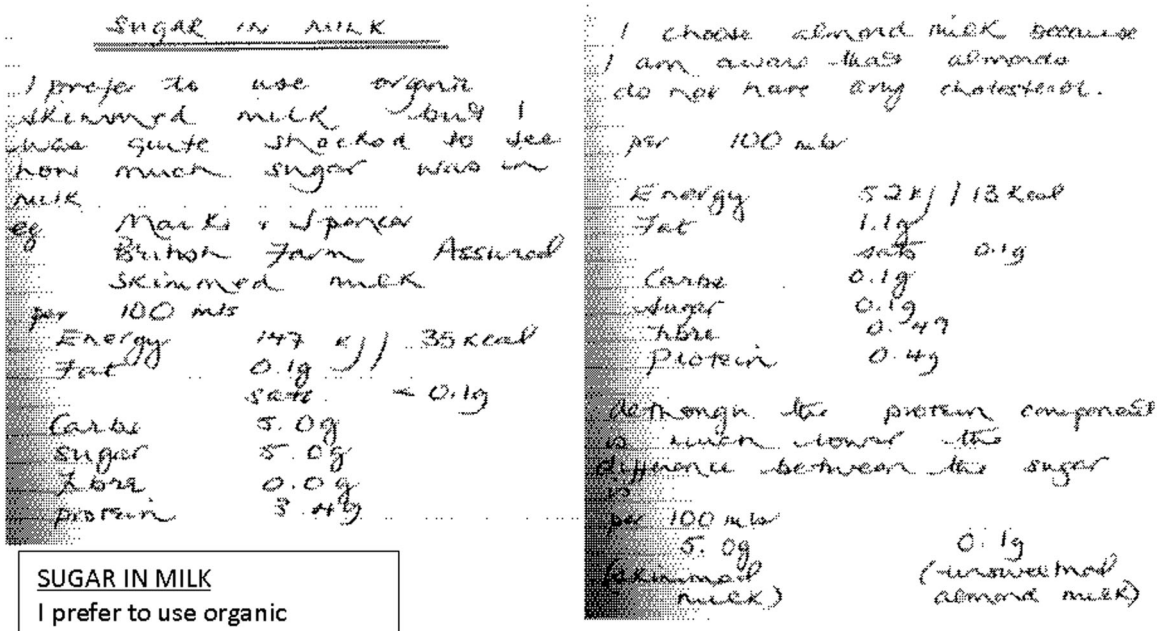
Despite FOP labels being considered clear, their information was not always easy to apply to daily food choices, and participants described needing mathematical skills to decipher both FOP and BOP labels. However, as participants tended to focus on single nutrients, especially sugar, the simplicity of the system which aims to deliver a clear message may lead to dietary imbalance.

Traffic light symbolism

Participants frequently used the words 'traffic lights' when talking about food labels. For example, Andrew used the words 'traffic light symbolism' when commenting on the varied use of colour in FOP labels and to his preference for the panel to be vertical rather than horizontal like the lights in use in the United Kingdom to control traffic.

Other participants also automatically viewed the colour-coding system as synonymous with the colours used in traffic lights, their focus being on the dangerous nature of foods labelled red rather than on the potential healthful nature of foods labelled green. Oscar described how he and his partner had made a rule whether to purchase foods with red labels. He said in his interview 'we've sort of made an unwritten rule between us, anything with two reds on we don't touch now'. Yvonne explained that she had been looking at the recipes she had collected that came with a colour-coding system and said '…it stares you in the face … Its red …when its high I throw those recipes away'.

The presence of FOP food labels appeared to emphasise the unhealthful nature of foods labelled red that they should 'not touch' (Oscar). Rather than green labels on food encouraging consumption, participants focused more on avoiding foods labelled red. However,



SUGAR IN MILK

I prefer to use organic skimmed milk but I was quite shocked to see how much sugar was in milk

eg Marks & Spencer
British Farm Assured
Skimmed milk
Per 100 mls
Energy 147 kj/ 35kcal
Fat 0.1 g
Sats < 0.1 g
Carbs 5.0g
Sugar 5.9g
Fibre 0.0g
Protein 3.4 g

I choose almond milk because I am aware that almonds do not have any cholesterol

per 100 mls

Energy	52kj	/ 13kcal
Fat	1.1g	
	Sats	0.1g
Carbs	0.1g	
Sugar	0.1g	
Fibre	0.4g	
Protein	0.4g	

FIGURE 3 Susan diary facsimiles (top) and transcription (bottom) with her analysis of the nutritional value of milk.

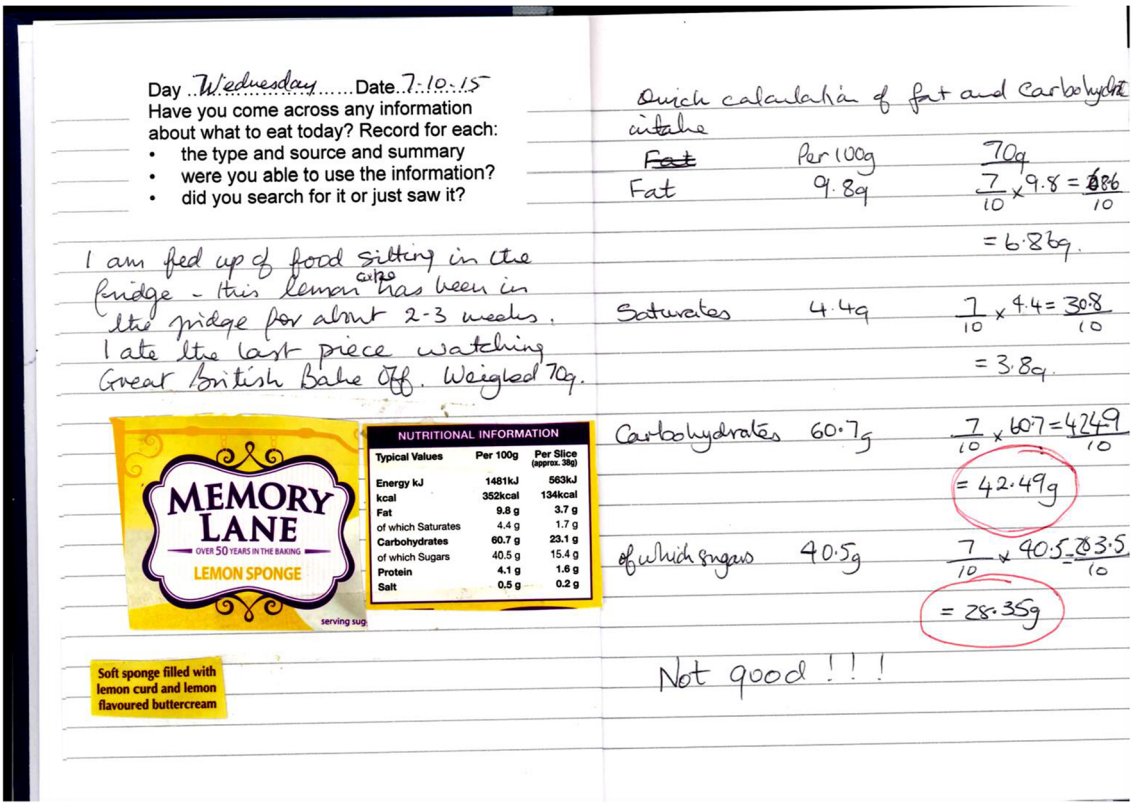
FOP food labels were not always found to be a useful self-management tool. For example, Isobel explained that she 'generally ignored' the traffic light system, as it did not appear relevant to her. She included a FOP label from some feta cheese that she had eaten querying why this food was considered 'very dangerous' to eat and yet was often included in meals from the Mediterranean whose diet was considered a healthy approach (Figure 6).

Isobel also identified instances where foods labelled amber and green may not be useful. For example, she analysed the FOP label on eggs and noted in her diary '.marked green for sugars…Of course!… Eggs are also amber for fat, saturates and salt… it would make me think eggs were a bit of a worry, not being all green. Yet I am told eggs are good for me'. (Isobel interview)

The intention of the FOP food label traffic light system is to be a simple way to convey the nutritional value of a food in the hope of encouraging a lower consumption of foods labelled red and an increased consumption of foods labelled green. However, for PLWT2DM, the effect appears to emphasise the 'dangerous' nature of foods labelled red without taking into account the inherent nutritional value of a food.

DISCUSSION

This study found that the use of both FOP food labels and the BOP nutrition information was embedded into the everyday information practices and self-management



I am fed up of food sitting in the fridge- this lemon cake has been in the fridge for about 2-3 weeks.

I ate the last piece watching Great British Bake Off. Weighed 70g

Quick calculation of fat and carbohydrate intake

Numbers not transcribed

Not good!

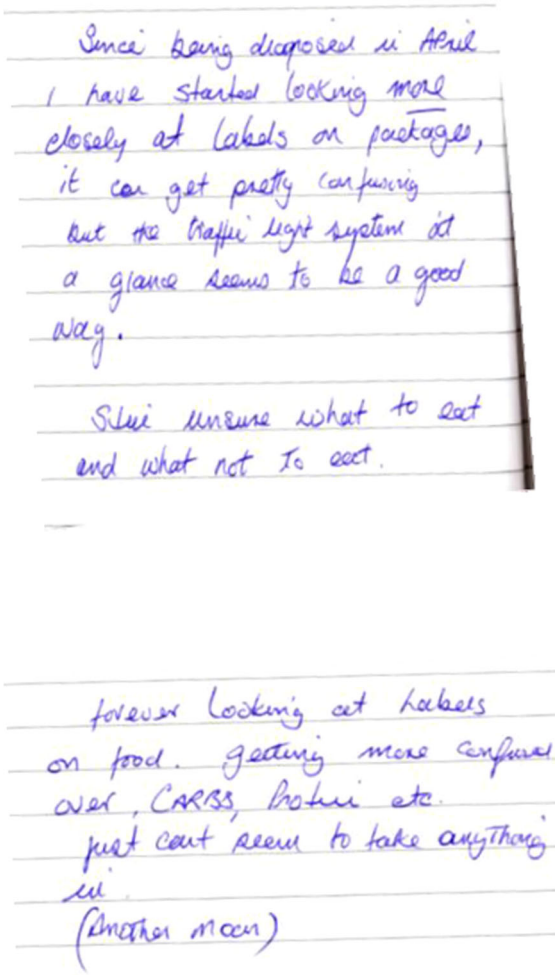
FIGURE 4 Lisa diary facsimile (top) and transcription (bottom) showing her calculations of the nutritional value of her portion of cake.

of PLWT2DM. Participants felt they were of value despite the lack of standardisation, such as format and colour.[I] However, they identified challenges in being able to interpret and make use of the food labels.

Other studies have also found that PLWT2DM frequently use food labels. For example, Gray et al.,[24] who used a knowledge survey and food frequency questionnaire among 124 people attending a diabetes centre in Australia with the aim of linking knowledge with sodium consumption, found that the majority of participants used food labels. Kessler and Wunderlich[25] found that almost all their 190 participants, the majority of whom were living with T2DM, used food labels. However, the authors of this study are not aware of any other studies which have explored the day-to-day use of food labels in PLWT2DM identifying the automatic and embedded use of food labels in day-to-day self-management.

There appeared to be a negative belief about sugar and a lack of understanding about carbohydrates and dietary sugars, such as the differences between free sugars and natural sugars, among the participants. Although Fitzgerald et al.[26] found that nutrition knowledge among PLWT2DM (n = 100, controls n = 101) was positively associated with food label use, Kessler and Wunderlich[25] found that despite food label use, the knowledge about the differences between sugar and carbohydrate was low among their participants. In this study, participants chose to reduce their intake of natural sugar at the expense of their protein intake. Similarly Breen et al.[7] found in their study exploring the understanding of carbohydrate among 15 PLWT2DM

[I]This study was undertaken before the guidelines were introduced to ensure that food labelling was standardised in terms of format and colour.[9]



Since being diagnosed in April I have started looking more closely at labels on packages, it can get pretty confusing but the traffic light system at a glance seems to be a good way.

Still unsure what to eat and what not to eat.

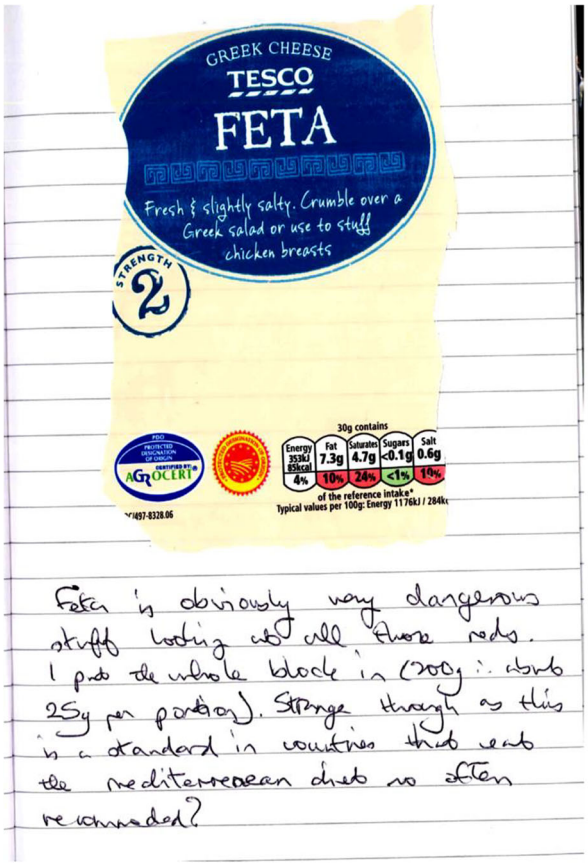
Forever looking at labels on food. Getting more confused over CARBS, protein etc. just can't seem to take anything in. (Another moan)

FIGURE 5 Jennifer diary facsimile (left) and transcription (right) from Day 2 and Day 6 of the diary period indicating her experiences with food labels.

that there was an overemphasis on sugar restriction leading potentially to an unbalanced diet.

Dietary sugars are classified as follows: total sugars which refer to the mono- and disaccharides in a food 'irrespective of the source' and thus will include naturally occurring sugars in 'intact' fruit, vegetables and milk; added sugars are those that have been added during preparation or processing; and free sugars are the mono- and disaccharides in foods excluding those from 'intact' fruit and vegetables and may be more important for PLWT2DM to be able to identify.[41,42] While food label rules in the United Kingdom require that the total amount of sugar is reported on food labels and used in the traffic light system,[12] the review undertaken by Mela and Woolner[42] suggests that the term 'added sugars' may be more easily understood, although there is limited research that relates to the perceptions of PLWT2DM with this term. However, Mela and Woolner[42] also emphasise the importance of finding a way of labelling for free sugars, as consumption of these is more closely related to the risks associated with the development of T2DM.

The need for mathematical skills in being able to interpret both the FOP food labels and the BOP nutrition information as identified in this current study has also been identified in other studies. For example, Klinovszky et al.[43] explored functional health literacy and self-management among PLWT2DM on insulin. They noted the importance of being able to undertake calculations to interpret the amount of carbohydrate in a particular food and then to relate this to their blood glucose levels and required insulin dose. Although in this study, the issue of multiple calculations was not discussed by the three participants who were on insulin, the need to be able to undertake calculations to understand the nutritional value in a portion size consumed was raised as a limiting factor in being able to use food label information. Similarly Rothman et al.[44] in their study with 200 people living with a long-term condition (41% PLWT2DM) also found that even those with higher



Feta is obviously very dangerous stuff looking at all those reds. I put the whole block in (200g therefore about 25g per portion). Strange though as this is a standard in countries that eat the Mediterranean diet so often recommended?

FIGURE 6 Isobel diary facsimile (left) and transcription (right) emphasising the use of red labels on front-of-pack (FOP) food labels.

levels of literacy and numeracy skills found the interpretation of food labels challenging.

Participants' perception of food labels was that foods labelled red were dangerous and should be avoided. There was limited reference to the presence of green and amber food labels and their potential healthfulness. There is a scarcity of research identifying the impact of amber food labels on the perceived healthfulness of foods; however, there is some which highlights the potential association of green with healthfulness and red with unhealthfulness. For example, Schuldt[45] asked 93 university students in the United States to rate the healthfulness of a chocolate bar with the calories presented in either a red label or a green label, and found a link between a perception of healthfulness and the colour green on food labels. However, Scarborough et al.,[46] who utilised an online questionnaire with 200 users of a UK supermarket chain, found that participants were more likely to take notice of foods labelled red than of those labelled green. The greater impact of food labels with a negative connotation (not just relating to colour) has also been found. Vasiljevic et al.[45] used smiling and frowning symbols on foods to convey approval and disapproval with the consumption of a food with 955 UK residents. Although not undertaken with PLWT2DM the study showed that symbols with a negative connotation appeared to have a greater impact than symbols with a positive connotation. The embodied overemphasis on avoiding foods labelled red identified in this current study may result in not only an over restriction of dietary habits but may also result in avoiding the consumption of foods that have positive health properties for PLWT2DM.

Limitations

This was a small study undertaken in one part of the United Kingdom. The ethnic diversity of recruited participants was not the main focus of the study and is not reported. We do not know how these findings would transfer to other parts of the United Kingdom or to those with different ethnic backgrounds. Just over half of participants were on medication to manage their T2DM. This may be a lower figure than was typical for PLWT2DM in the United Kingdom at the time of the study when 77% were prescribed medication.[46,47] Although the findings appear to concur with those of previous research with PLWT2DM, further research is needed. For example research is needed with those with Asian or African ethnicities where there is a higher percentage of PLWT2DM, as this may impact on the

everyday use of food labels as a source of nutrition information.

Recommendations for practice and research

This study showed that food labels are a major source of information. There is potential for food labels to provide information in a more effective/useful way for PLWT2DM especially, as there is now an opportunity to review food labelling in the United Kingdom following the publication in 2022 of the 'Health and Care Bill: food information for consumers – powers to amend retained EU law'.[48] However, currently the aim of the FOP labelling system is primarily to help prevent the development of obesity, diabetes, cardiovascular disease and cancer as opposed to assisting people living with the long-term conditions including T2DM in being able to manage their diet. Thus the challenges of a 'one-size-fits all' design have led to some limitations in the approach used in the United Kingdom. There are other approaches such as the Nutriscore system which has been shown to be effective in Europe[49]; however, the system is still aimed at the general population, and it is unclear if the system is of value to PLWT2DM in managing their diet. In the short term, HCPs and education programmes and patient organisations should focus more on assisting PLWT2DM to apply food label information to their own daily food choices. More time needs to be spent encouraging the consumption of foods labelled green on the FOP food labels as opposed to emphasising avoidance of foods labelled red, focusing on carbohydrates that are healthy to eat and the differences between natural, free and total sugars. In the longer term, there is an opportunity to involve PLWT2DM more frequently in food label research. There is a need to work towards an inclusive system which will help them to self-manage their condition and to prevent feelings of disempowerment and stress when faced with food labels and decisions about which food to eat.

CONCLUSION

Nutritional information on food packaging has the potential to assist PLWT2DM to self-manage their condition. However, everyday tacit practices involving following negative information, beliefs about nutrients and ingredients and the need for high-level maths skills currently limit their value. HCPs and patient organisations should ensure that protected time is spent on educating PLWT2DM on how to apply nutritional information on food packaging to their own food choices. Policymakers should consider ensuring that PLWT2DM are involved in research relating to nutritional information on food packaging to ensure that future versions are relevant to this increasing group of the population.

AUTHOR CONTRIBUTIONS

Jane McClinchy devised the study as part of her PhD studies supervised by Angela Dickinson and Wendy Wills. Jane McClinchy collected and analysed the data. All authors contributed to initial interpretation, the writing of the first draft and critical revision of the manuscript and gave the final approval.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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