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Systematic Review of Community Type 2 Diabetes Structured Health Education (CT2DSHE)

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Abstract

Aim: This paper aims to evaluate disparities of type 2 diabetes structured health education programmes that is utilised within the communities. **Design:** systematic review, (a type of secondary research design) aiming to summarize the results of prior primary research studies on available evidence Community type 2 diabetes structured education (CT2DSHE). **Methods:** Research question: Type 2 diabetic structured health education within a community how effective is it? Qualitative Systematic review, defined as a way to get reliable and objective picture of current available evidence on the specific topic—(CT2DSHE), (Denscombe, 2021) through reflexivity synthesis of available data as an example. This is valuable in time constraints such as project assignments that must be met within specific time and also to bring together available evidence together [1]. **Results:** This review has shown that CT2DSHE is effective with seven out of the eleven authors supporting, three authors against and one was neutral, further showed that knowledge and skills acquired can last longer with patient activation improved among T2DM patients ideal for sustaining their self-management of T2DM. Conclusion: This research provides suggestive answers to the research question: "Type 2 diabetic structured health education within a community how effective is it?", This has demonstrated CT2DSHE effectiveness in knowledge acquisition and improving T2DM awareness among T2DM patients, whilst evidencing long effects beyond the study times of 3 - 9 months period in relation to patient activation. Also Identified diabetes education self-management on newly diagnosed (DESMOND) patient as CT2DSHE program for recommendation. **Patient or Public Contribution:** This work aspires to contribute to CT2DSHE in these areas; Influencing policy decision-making for community diabetes care within the UK and world at large., Contributing to already vast knowledge on diabetes self-management and reasons why?, Influencing educators on how CT2DSHEP are designed, delivered by putting the patient at

the Centre and bringing different perspectives on CT2DSHEP in one place that is serving users time of having to consult several resources especially busy clinicians [2] [3].

Keywords

Community Health, Education, Effectiveness, Impact, Structured and Planned, Type 2 Diabetes (T2DM)

1. Introduction

Background: A globally large amount of research has been conducted about CT2DSHE programmes, but patients with Diabetes including those with T2DM continues to struggle managing their conditions effectively. [4] and [5] cites this example, "diabetes self-management education and support (DSMES) programs have struggled to deliver sustainable, effective support for adults with diabetes (AWDs) to improve self-management behaviours, achieve glycemic goals, and reduce risk for complications. 1n 2017, "The international diabetes Federation (IDF) estimated about 451 million adults are living with T2DM Worldwide, and is projected to rise to 693 million by 2,045 if no prevention methods are adapted [6]. "However, DSMES have limited evidence against which to benchmark results or give guidance as to their effectiveness." [7] Besides, evidence continues to project increasing trends of varied provision of health education among T2DM patients, and when they do, follow-up study reports indicate even among those who have received CT2DSHE; their self-management care when evaluated appears not very satisfactory in this group of patients. Recent studies utilising T2DE approaches report progress in uptake and result for this group of patients [8]. "To date, no study has examined the effectiveness and acceptability of CT2DSHE programmes for adults with T2DM." [9] This has practice and educational implication in how these services are designed and delivered. This being the case is one reason to explore available evidence in literature. The aim of this study is "to evaluate disparities of type 2 diabetes structured health education programmes that is utilised within the communities". "Community" in this study includes these places (clinics, urban and rural communal centres, first-level hospital diabetic services and patient's own homes).

What is known: Exposure to T2DE programs has been shown to be related to improving patient's clinical metrics e.g., serum blood glucose (SBG) and glycated hemoglobin (HbA1c) in various randomized controlled clinical trials between 3 - 6 months period. Then, the direct link with improved T2DM patient's complication reduction as well as control of diabetes in clinical metrics with T2DE exposure. Lastly, health literacy supports better patient DSMS [10].

The gap this review is addressing: While T2DE programmes are reported effective to patient's acquiring knowledge and diabetes self-management skills (DSMS), much uncertainty still exists about the relationship between patients'

kwledge and their DSMS, plus how long such knowledge is held by the patients following exposure T2DE programmes. There is little consensus on CT2DSHE program's effectiveness in practice owing to the continued raising numbers of people suffering complications of T2DM [11]. Last but not least, [10] suggests that there is a gap in patients' awareness of T2DM and scanty knowledge on what motivates patients or not to initiate DSMS, a gap this research is addressing.

Aim: To evaluate disparities of type 2 diabetes structured health education programmes that is utilised within the communities.

Objectives: The purpose of this literature review is 1) To review effectiveness of current structures of type 2 diabetic education. 2) To appraise current structures of type 2 diabetic health education programmes. 3) To propose recommendations based on this evaluation of which programme can be integrated into the national health services (NHS).

2. Methods

Research question: Type 2 diabetic structured health education within a community how effective is it?

Qualitative Systematic review, defined as a way to get reliable and objective picture of currently available evidence on the specific topic [2] through reflexivity synthesis of available data as an example. This is Valuable in time constraints such as projects assignments that must be met within specific time and also to bring together available evidence together [1].

Search strategy: Boolean search strategy was used searching main databases: Scopus, and (EBSCOhost) Medline, CINAH, ASSIA, APA. With **Keywords: "**Type 2 Diabetes (T2DM), community, health, education, effectiveness, impact, structured and planned**.**"

Restriction selection criteria: To studies with randomized controlled trials (RCTs), full text accessed via open access online., evaluated the effects or impact of CT2DSHE, supported preventative interventions programmes (CT2DSHE) in T2DM patients with other chronic condition e.g., hypertension, published in English-language and peer-reviewed journals. Articles were excluded if they did not meet this inclusion criteria, directly make reference to T2DM, health education, or provided insufficient data on any of the identified themes and had no RCTs. The outcome as per Prisma below.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372:n71. doi: 10.1136/bmj.n71.

For more information, visit: http://www.prisma-statement.org/

Study selection: included reading the titles and abstracts of identified literature. Excluded clearly irrelevant studies, reviewed full text of the remaining articles for inclusion. The reference lists of the included studies and relevant review papers were also examined to identify missed articles. PICO (P-Illness-T2DM, I-Structured community health education/Types of structures/inter-

ventions adopted/Used, C-Community health education with no structure planned, O-increased Level of diabetic knowledge, attendance rates, mastering of self-management of T2DM skills, and reduced rates of diabetes complications) was the framework used.

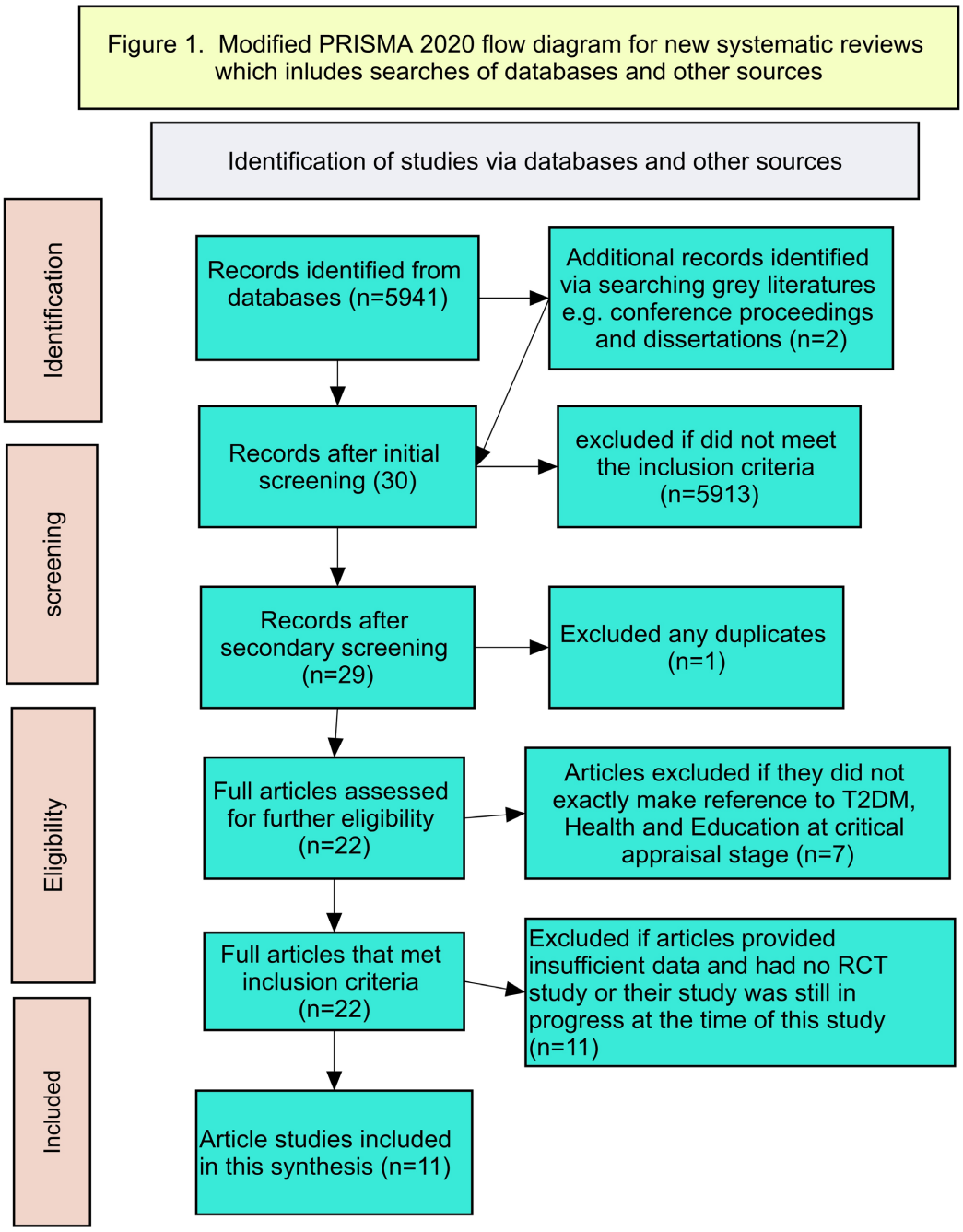


Figure 1. Prisma.

Assessment of Quality of Evidence: This was done using the above MARU critical appraisal form as per (**Table 1**) for each selected article. Plus, evaluation of its impact score as per (**Table 2**) below.

Table 1. Shows modified Anglia Ruskin University (MARU) critical appraisal form.

Modified Anglia Ruskin University (MARU) critical appraisal form for qualitative research					
Title of paper					
Author(s)					
No	Criteria	Yes	No	N/A	Unclear
1	Is there congruity between the stated philosophical perspective and the research methodology?				
2	Is there congruity between the research methodology and the research questions and/or objectives?				
3	Is there congruity between the research methodology and the methods used to collect data?				
4	Is there congruity between the research methodology and the presentation and analysis of the data?				
5	Is there congruity between the research methodology and the presentation of the results?				
6	Is there a statement locating the research culturally or theoretically?				
7	Is the influence of the researcher on the research addressed?				
8	Are the voices of the participants adequately presented?				
9	Is the research ethical and have recent studies demonstrated evidence of ethical approval from appropriate body?				
10	Do the conclusions drawn in the research appear to flow from the analysis and interpretation of the data?				
11	Does the paper cover any of these: 'Type 2 Diabetes (T2DM), community, health education, effectiveness, impact, structured and planned?"				
12	Did the research explore any T2D self-management education/intervention or treatment?				
Include in review: Yes Reasons and Comments		No		Unsure	

Table 2. Shows each journal's impact score.

Number	Author	Journal and Dol	Impact factor
1	Do Rosario *et al.*, (2017)	BMC Endocrine Disorders [https://doi.org/10.1186/s12902-017-0222-2]	Impact Score: 3.13 h-index 45 SJR: 0.728. Overall Rating: 6514
2	Eades and Alexander, (2019)	Health Expectations [https://doi.org/10.1111/hex.12959]	Impact Score: 3.33 h-index 78 SJR: 0.926. Overall Rating: 4591
3	Jeem *et al.*, (2022)	International Journal of Environmental Research and Public Health [https://doi.org/103390/ijerph192013638]	Impact Score: 4.54 h-index 138 SJR: 0.814. Overall Rating: 5586
4	Liu *et al.*, 2019.	JMIRmHealth and uHealth [https://doi.org/10.2196/15779]	Impact Score: 5,50 h-index 68 SJR: 1.362 Overall Rating: 2491
5	Miller *et al.*, (2020)	Patient Education and Counselling [https://doi.org/10.1016/j.pec.2019.10.013]	Impact Score: 3.18 h-index 146 SJR: 0.844. Overall Rating: 5297

Continued

6	Moses and Olink, (2019)	Journal of American Pharmacists Association [https://doi.org/10.1016/j.japh.2019.05.014]	Impact Score: 1.49 h-index 67 SJR: 0.429. Overall Rating: 11440
7	Okube, Kimani and Mirie, (2022)	Journal of Diabetes and Metabolic Disorders (2022) 21:607-621 [https://doi.org/10.1007/s40200-022-01023-1]	Impact Score:2.61 h-index 37 SJR:0.476 Overall Rating: 10486
8	Pienear and Reid, (2020)	BMC Public Health [https://doi.org/10.1186/s12889.020-09954-1]	Impact Score: 3.98 h-index 156 SJR: 1.156. Overall Rating: 3237
9	Price *et al.*, (2022)	Campbell Systematic Reviews [https://doi.org/10.1002/cl2.1264]	Impact Score: 2.74 h-index 10 SJR: 0.647. Overall Rating: 7539
10	Singh *et al.*, (2018)	The Science of Diabetes Self-Management and Care [https://doi.org/10.1177/014572178795589]	Impact Score: 2.53 h-index 78 SJR: 0.912. Overall Rating: 4714
11	Ye *et al.*, (2021)	Diabetes Care [https://doi.org/10.2337/dc20-0307]	Impact Score: 12.23 h-index 380 SJR: 6.528. Overall Rating: 166

Ethical appraisal: This study was registered with International Prospective Register of Systematic Reviews **PROSPERO (CRD42023407057).** Ethical approval ref**: Ethics ETH2223-3728: (Low risk: Green)**.

Outcome Measures: Included effects or impact of CT2DSHE on T2DM patients by and including nursing staff in variety of setting. and their perceived adoption for implementation in the community. Plus, CT2DSHE evidence's contribution to patient's knowledge, DSMS, perception of T2DM disease, the length of retention, reported patient activation and improvement (changes in clinical metrics e.g., HbA1c levels, behavioral e.g., medication adherence and knowledge e.g., diabetes knowledge) following CT2DSHE program exposure.

Data extraction: Followed these study characteristics from each included articles: Authors, publication year, CT2DSHE program, impact or effect on HbA1c, T2DM patient's knowledge, skill, any changes on their perception about T2DM plus in baseline end of the trial in both intervention and control groups and trial time length, features of the interventions.

Data analysis: Analyzed outcomes and objectives thematically. pooled across data using identified themes and compared for objective one and two while for three, nineteen statistical scoring criteria was utilised to help identify CT2DSHE program to be put forward for recommendation. Each CT2DSHE program received a score out of available 50 points, calculated and compared across the identified programmes. DSME, with four versions of peer support models had the overall score, the first single score selected in each of the 19 statistical scoring criteria and then divided by four to obtain average score used to compare with other programmes. Then, it reflexively and narratively synthesized so as to further strengthen selection evidence for CT2DSHE program for recommendation. These programmes were further stratified by first, programme reported strength by papers included in the study to examine the effects they had on T2DM patients, secondly by reported weaknesses by papers included in the study to identify those least effective in terms of effects or impact of CT2DSHE on T2DM patients and their perceived adoption for implementation in the community.

3. Results

Thirty articles were identified through online search that included two articles acknowledged through reference list, one article duplicate was discarded making the number of articles 29 that were eligible for further screening. The inclusion and exclusion criteria were used to select these papers. After further screening only eleven articles were eligible for this review synthesis. The Prisma, a preferred reporting items for systematic review and Thematic synthesis [12] flow diagram is used as shown below in (**Figure 1**) above.

Characteristics of the papers included in this study: In terms of methods used; two papers employed mixed methods [13] [14], four papers used systematic reviews [15]-[18], and five papers utilised randomized control studies [11] [19]-[22]. Ten Papers explored different CT2DSHE programs in terms of their impact on patients Knowledge and behavioural influence (activation of diabetic self-management skills (DSMS), their perceptions, etc.) and evaluation of their acceptability in the community and the reasons behind those actions [11] [14]-[18] [19]-[22]. One paper [13] sought to understand the reason why patients miss their diabetic appointments.

Themes The papers were analysed to identify themes at the initial review of literature results of this review are shown in (**Table 3**) below.

Table 3 above shows the results obtained from the preliminary analysis of primary research themes. In summary, these results show that still shows CT2DSHE programme variations in how they are delivered, who delivers and where they are delivered. This is consistent with what was found by [23].

Table 3. Showing theme analysis.

Number	Author	**Theme 1** Three delivery practice levels of how CT2DSHE is provided in the communities	**Theme 2** Community Structured Type 2 diabetes education is provided in a variety of ways	**Theme 3** CT2DSHE programmes are mainly facilitated by community practitioners	**Theme 4** Health literacy (HL) leads to better T2DM self-management outcomes
1	Do Rosario *et al.*, (2017)	Level 3 only	One-to-one and use of Telephone by CHW.	CHW at health centre	Yes about diabetic knowledge.
2	Eades and Alexander, (2019)	Level 3 only	one to one – via face to face by CHW	CHW	Yes knowledge why patient do not want to attend diabetic appointments.
3	Jeem *et al.*, (2022)	Level 2 and 3	Only one method-Mobile app.(one to one)	Web-based and wearable devices	Yes about diabetic knowledge.
4	Liu *et al.*, (2019)	Level 1 and 2	Only one method-Mobile app.(one to one)	Via Mobile app	Yes – Literacy - (Inform of awareness.

Continued

5	Miller *et al.*, (2020)	Level 1, 2 and 3	By two methods one to one, and group sessions by educators and Health professionals	Health professionals and Trained DESMOND educators	Yes about the Diabetic knowledge and skill to manage *i.e.* Glucose levels etc.
6	Moses and Olink, (2019)	Level 3 only	Group /or classes - face to face by CHW	CHW	Yes about the Diabetic knowledge and skill to manage *i.e.* Glucose levels etc.
7	Okube, Kimani and Mirie, (2022)	Level 1, 2 and 3	Group/ or classes face to face with written handouts by CHW	CHW at Primary health hospital	Literacy - about knowledge diabetic risk factors
8	Pienear and Reid, (2020)	Level 1 and 2	By two-one method-Mobile app, one to one, and group sessions -face to face (CHW + Peers)	CHWs plus peer support	Yes – Literacy - (inform of diabetic knowledge)
9	Price *et al.*, (2022)	Level 2 only	One to one -face to face by peers.	By Peers - Fellow patients	Yes – Literacy - (inform of diabetic knowledge)
10	Singh *et al.*, (2018)	Level 1, 2 and 3.	By two-One to one and use of telephone by Health professionals	By Health professionals at the centres	Yes -Literacy (GDM management and future disease risk perceptions)
11	Ye *et al.*, (2021)	Level 1, 2 and 3.	By two methods one to one, and group sessions by CHW + PL	by CHW + PL	Yes about the Diabetic knowledge and skill to manage *i.e.* Glucose levels etc. focusing on quality of life

Table 4. Showing papers views about CT2DSHE as sub theme 1.

Number	Author	Those in favour that CT2DSHE is effective.	Those against that CT2DSHE is not effective	Those that are neutral in views.
1	Do Rosario *et al.*, (2017)	Yes	No	No
2	Eades and Alexander, (2019)	No	Yes	No
3	Jeem *et al.*, (2022)	No	Yes	No
4	Liu *et al.*, 2019.	No	Yes	No
5	Miller *et al.*, (2020)	Yes	No	No
6	Moses and Olink, (2019)	Yes	No	No
7	Okube, Kimani and Mirie, (2022)	Yes	No	No

Continued

8	Pienear and Reid, (2020)	No	No	Yes
9	Price *et al.*, (2022)	Yes	No	No
10	Singh *et al.*, (2018)	Yes	No	No
11	Ye *et al.*, (2021)	Yes	No	No

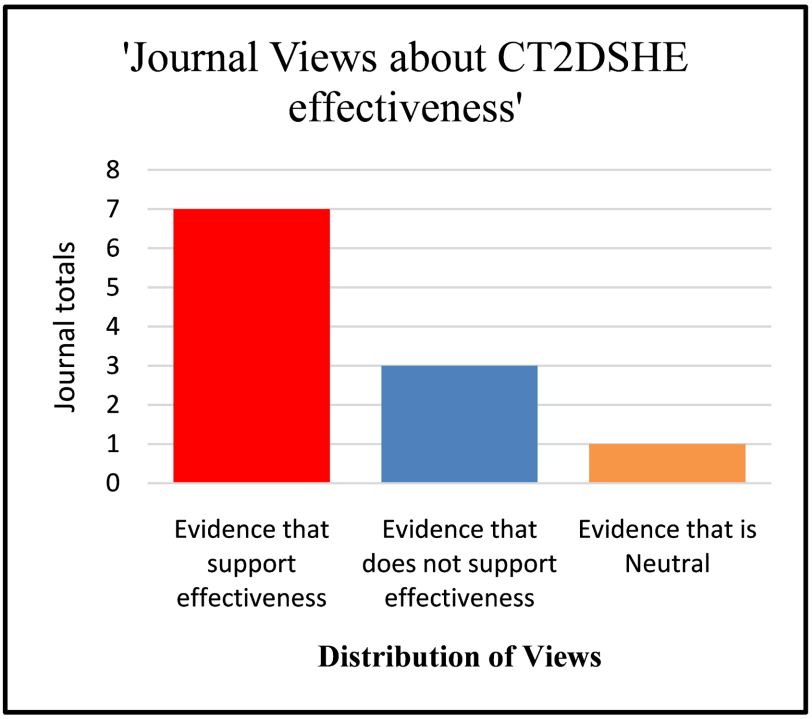


Figure 2. Showing evidence support for, against and neutral.

To address objective 1 "To review effectiveness of current structures of type 2 diabetic education (T2DE)". The following results were obtained. When the 11 papers were assessed as to what are the paper's view were on CT2DSHE, Seven [11] [14] [18]-[22] of the papers supported the argument that CT2DSHE is effective in some ways, three [13] [15] [16] papers supported the argument that CT2DSHE is not effective among T2DM patients who had attended some form of CT2DSHE programmes, What are the reasons for the 3 authors object to the validity of CT2DSHE? They cite a) Reductions in HbA1c levels were similar across subgroups, with no significant differences between them [16], b) As health education intervention during Long-term follow-up showed mobile health interventions were no more effective than controls in reducing type 2 diabetes incidence [15] and c) Participants' understanding of their condition and perceptions of personal control and treatment control were all low in the present study blaming practical barriers such as non-attendance as one reason [13]. While one paper [17] was neutral or that did not support either side of argument as shown in **Table 4** and **Figure 2** shows included papers on how CT2DSHE effectiveness is viewed.

Each valuable to receive a score of 5 if sufficient evidence, 3 some evidence and 0 no evidence at all	Do Rosario et al., (2017)	Eades and Alexander, (2019)	Jeem et al., (2022)	Liu et al., 2019.	Miller et al., (2020)	Moses and Olink, (2019)	Okube, Kimani and Mirie, (2022)	Pienear and Reid, (2020)	Price et al., (2022)	Singh et al., (2018)	Ye et al., (2021)
Evidence indicating that Impact of T2DE can last longer than study trial period or longer than twelve months	5	0	0	5	5	0	0	0	0	0	5
Evidence supporting CT2DSHE program effectiveness or impact on T2DM patients/ individuals leading to sustained change in knowledge acquision resulting in reduction in Clinical metrics eg SBG/HbA1c.	5	3	3	5	5	5	5	5	5	5	5
Evidence supporting the sustained change in attitudes and adherence(lifestyle modification) to diabetes management regimes after CT2DSHE pregram	5	3	5	5	5	5	5	3	3	5	5
Evidence of patient activation to support with self-efficacy for healthy coping with stress and adjusting medications or food intake to reach ideal blood glucose levels and Patient's will to prevent diabetes complications.	5	3	3	5	5	5	5	3	3	3	5
Totals	20	9	11	20	20	15	15	11	11	13	20

Figure 3. Showing analysis of main review outcome evidence.

What stands out in this (**Figure 3**) is that knowledge retention can last longer that earlier thought after further exploration of sub-theme 1 linked to outcome described as the length of retention or reported patient activation improvement in T2DM patients after exposure to CT2DSHE and theme 4 in (**Table 3**).

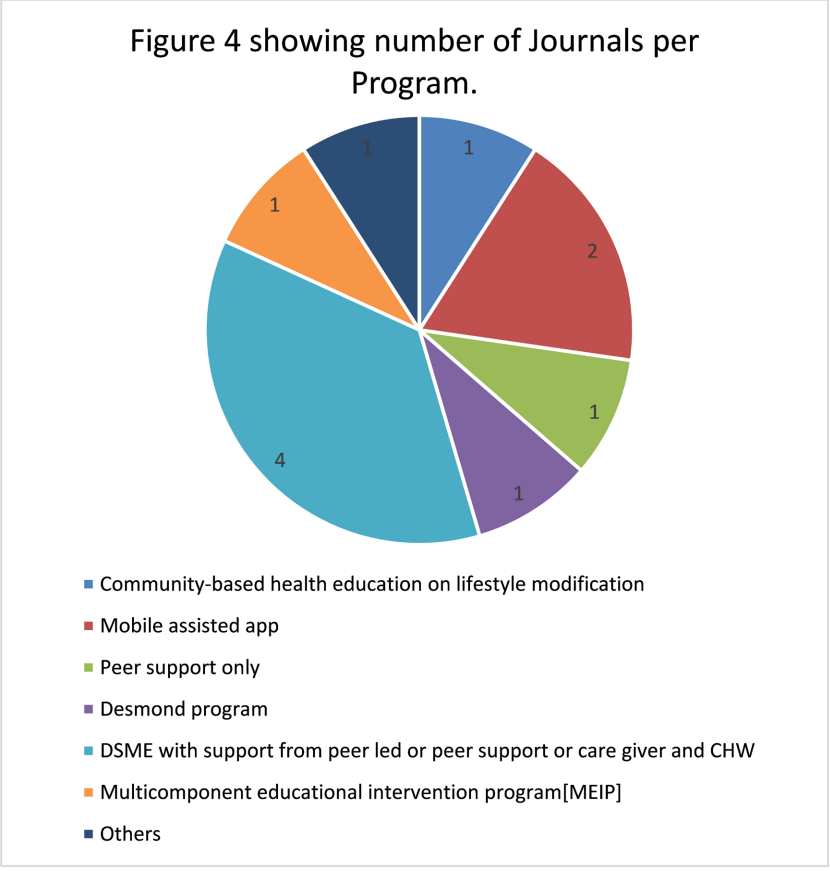


Figure 4. Showing number of journals per program.

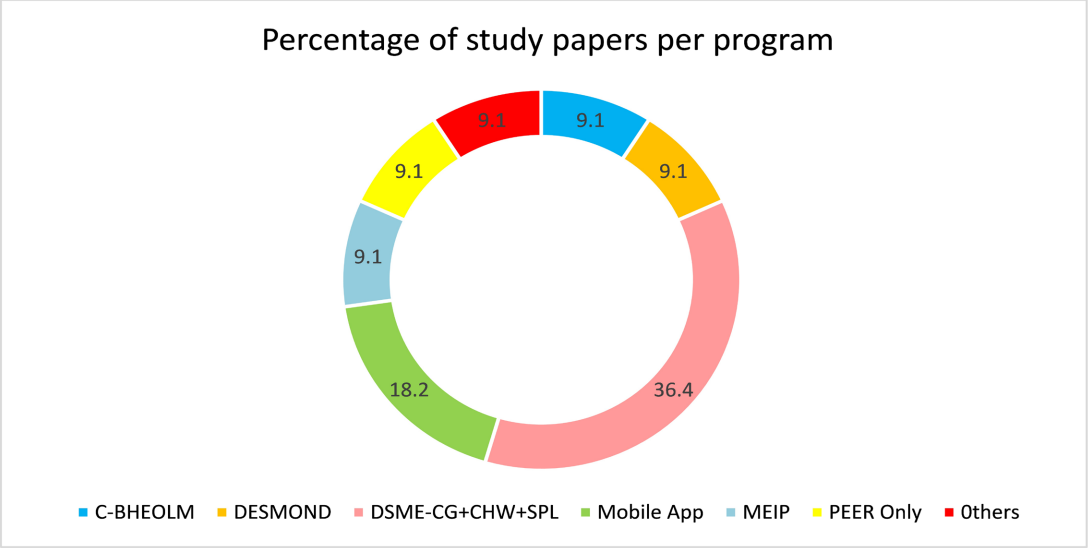


Figure 5. Chart showing percentage of papers that explored each program.

Primary theme 2 in **Table 3** linked to (**Figure 4** and **Figure 5**) shows analysis of Structures of T2DE in the Community in order to address objective 2. First, the author explored CT2DSHE structures in terms of programmes, the results were DSME with Support from Peer Led-(PL) or peer support-(PS) or care giver-(CG) and community health worker-(CHW) = [DSME with CG, CHW, PL & PS] was found in four papers [11] [14] [17] [21] came first, followed by MOBILE assisted app (Combination of mobile apps and web-based T2DE) found in two papers [15] [16] followed by four other programmes each found in only one paper; Desmond program [20], Peer support only [18], Community-based health education on lifestyle modification [22] and Multicomponent educational intervention program (M-CEIP) [19].

Secondly, T2DE programmes were subjected to nineteen core statements which the author believes to be important in decision-making when addressing objective 3 in this research project. Why because they are crucial to the content of T2DE that is delivered to the T2DM patients in activating self-care activities, performance and maintenance of DSMS and adherence to T2DM management or treatments on one side and on the other side is crucial to educators, facilitators and peer support who form patient's resource base and support network to the patient. From an educator's perspective, this demonstrates evidence-based education on theory, empirical data and one that has been accredited. As shown in **Figure 6** and **Figure 7**, as well as **Table 5** below. Based on (**Figures 6 and 7**)'s results, DESMOND program stood out as potential to be put forward for recommendations following the evaluation above.

What stands out in (**Figure 6**) is that no one CT2DSHE program was based on historical evidence, only MEIP was based on statistical values and four evidence promotion awareness of T2DM.

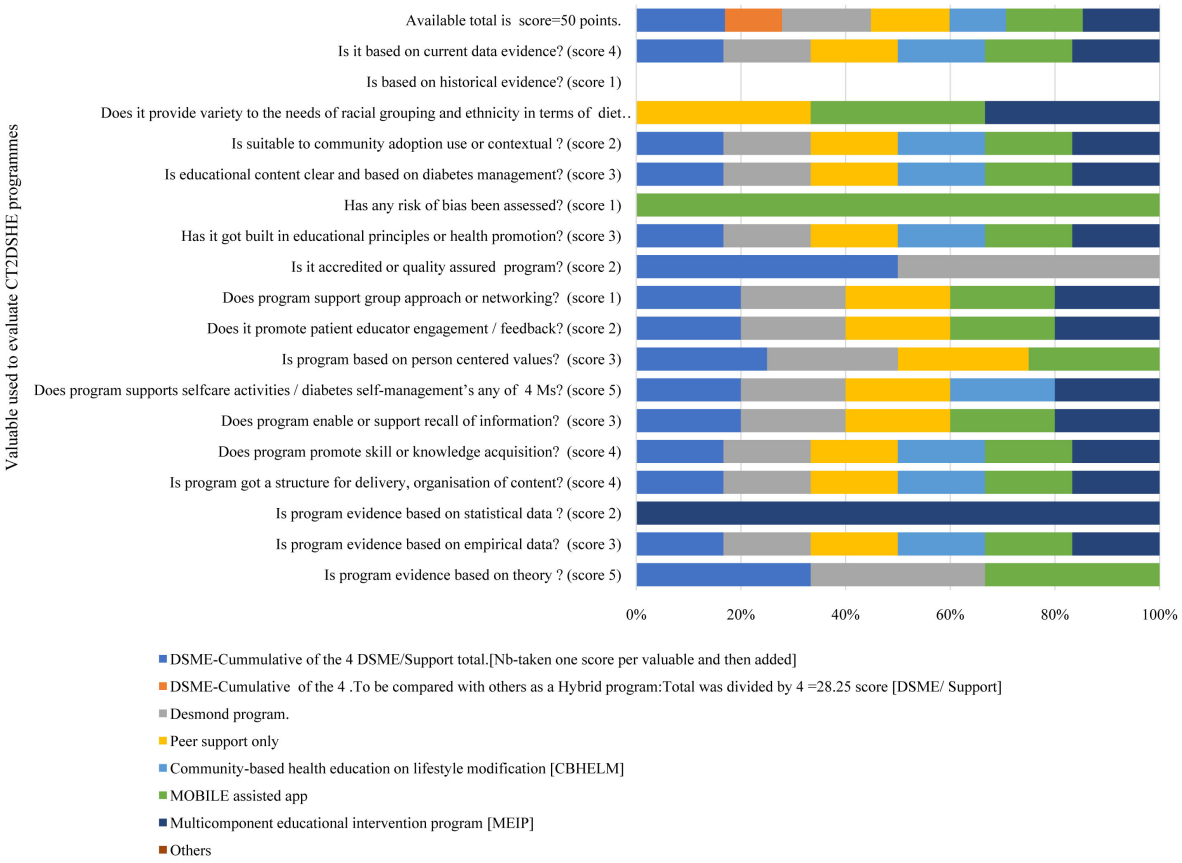
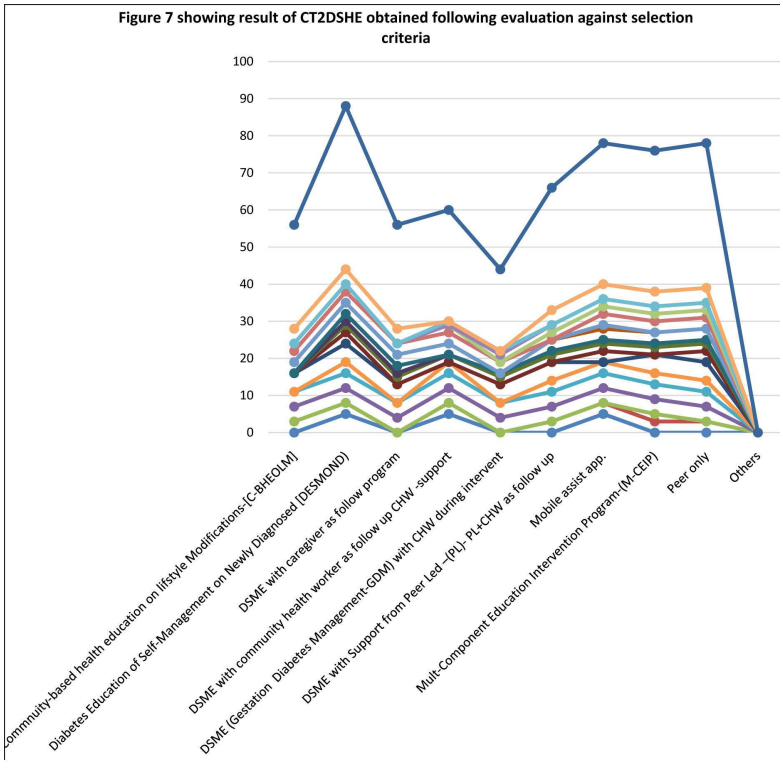


Figure 6. Shows CT2DSHE evaluation evidence map during program evaluation using 19 statements in percentage.



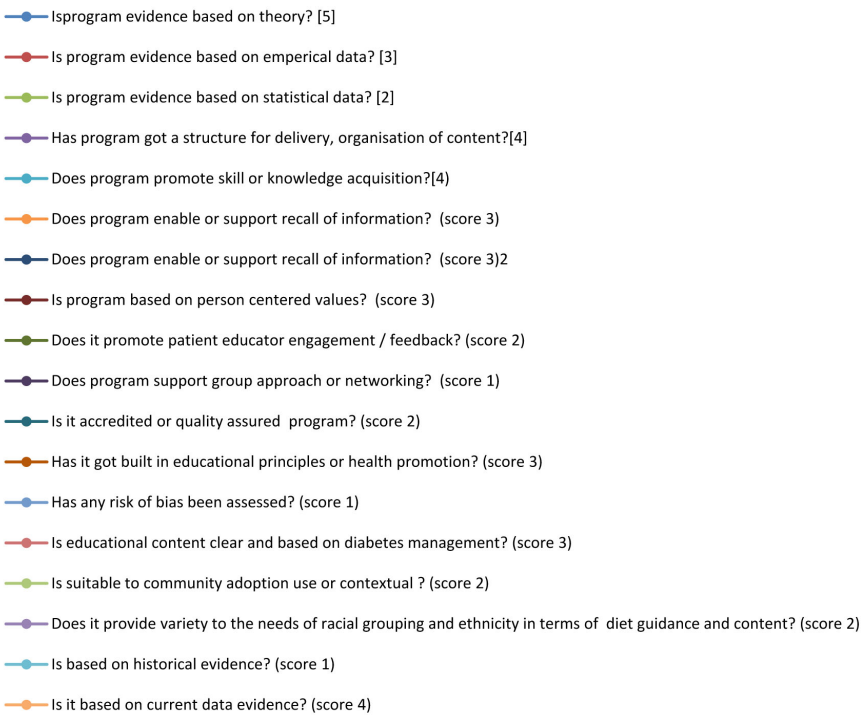


Figure 7. Results of program evaluation using 19 statements each with assigned score.

What emerges from the results reported (**Figure 7**) is that DESMOND is the standout among the identified seven CT2DSHE programmes with forty-four points out of available fifty points.

4. Discussion

This systematic review analyzed eleven study papers first to ascertain effectiveness of CT2DSHE, secondly to establish what structures of T2DE were prevalent in the studied papers and third, these CT2DSHE programs were evaluated in relation to improving patient's DSMS or self-care in order to be recommended for adoption by National health services (NHS) for the communities' adoption and to be utilised by health and a nurse in variety of setting.

This study employed a variety of methods to explore the research question. MARU critical appraisal form and Journal's impact score was used to assess article quality and was judged to be good for this review (**Tables 1 and 2**). Half of the studies were evaluative in nature focused on one form of evaluation only and the remaining one quarter assessed use of mobile apps by T2DM patients, and the other one quarter were systematic review focused at examining individual program as to their acceptability, accessibility and their contribution to DSMS for the patient.

4.1. How Effective CT2DSHE Is?

The first objective of this study sought "to review effectiveness of current structures of type 2 diabetic education". Reflexive and Narrative synthesis approach

was chosen to evaluate the effectiveness of CT2DSHE programmes as suggested by [24] These methods are particularly useful in studying the patient's attitude and behavioural changes which impact clinical metrics like HbA1C, where the aim is to maintain near or normal clinical health indicators. On the question of effectiveness, this study found that most studies [11] [14] [18]-[22], shows a patient's HbA1C improvement (**Table 4**). Most striking was the substantial difference between **Table 4** and **Figure 3** for CT2DSHE's effectiveness when compared, in (**Table 4**) seven papers supported while in **(Figure 3**) all papers support this argument these differences must be viewed with caution in (**Figure 3**). Engagement the question about how engaged patients in CT2DSHE are, must be considered here? One aspect of engaged patients in the CT2DSHE program is to actively participate in personalized education sessions tailored to their needs, [11] [16] [19]-[22] in **Figure 3** last 2 variables, evidence suggests that participants were utilizing interactive digital tools like mobile apps or pears to enhance their understanding and management of their condition. Regular follow-ups and feedback keep them motivated, allowing for continuous improvement and sustained engagement. This suggests T2DM patient do engage in CT2DSHE programmes when offered to them. However, these differences must be viewed with caution in (**Figure 3**) as two papers reported some evidence while nine papers reported sufficient evidence. These differences may have arisen due to the application of evaluation interpretation of evidence between the tables above. According to [25]**,** Hb1AC is one measure of determining program effectiveness like that of CT2DSHE. And goes on to "conclude that successful diabetes education involves changing participant cognitions and behaviours". Another question that arises is, "how to continuously improve patients' knowledge of DSMS and T2DM?" One effective way to continuously improve patients' knowledge of DSMS and T2DM is to implement a structured, ongoing education program that combines regular in-person workshops with online resources, ensuring that information is always up-to-date and accessible and tailored to the individual. [13] [15] [16] [19].

In contrast, (**Figure 3**) shows that studies [13] [15] lacked sufficient evidence. Additionally, there were inconsistencies in some clinical studies on CT2DSHE effectiveness in relation to SBG self-monitoring [17]. These results further support the idea of CT2DSHE effectiveness to improve HbA1C as previously found by [21] where the Health belief model was used to frame interview questions that explored concept of patient's perceived benefits, barriers and self-efficacy to having a caregiver attend T2DE. These results reflect those of [26] who also found that having positive experience is implied as determinant of program effectiveness. The "Health belief model" is known to help researchers show why patients acted like they did, which is linked to motivation theories. It can therefore be assumed that a patient who has received T2DE, will be aware of the T2DM complications, and will be motivated to modify their attitudes – how they perceive diabetes as a disease and behaviour in terms of physical activities or dietary intake [22] to avoid these complications. Inference can therefore be made that CT2DSHE has had an impact or is effective in achieving lifestyle modifica-

tion that helps achieve glycaemic control or improvement in the HbA1C results as per (**Figure 3**) results above. Conclusion can be made to some degree that CT2DSHE is effective. And therefore assumed that nursing or midwifery staff in their practice of patient education may be useful to make use of these findings.

4.2. T2DE Structures Analysis

The second objective was "to appraise current structures of T2DM health education programmes". This study on eleven papers identified and explored tenCT2DSHE programmes in total as shown in (**Figure 7**). These programmes results are in agreement with those obtained by [23] that varies in terms of its method of delivery and level of program ranging from one -program not accredited mainly at diagnosis stage to three programmes that has been accredited by bodies such National Institute of Clinical Excellence (NICE) [6], content, and who facilitate them. These findings support the idea that variety is good for the accommodation of different T2DM Patients care needs mirroring learning styles of patients' stage at which they are, on their diabetic journey; for educators to tailor their learning content that suits individual patients and communities. The present results are significant in at least two major respects, first to explain the discrepancy that exists between knowledge and T2DM patient's DSMS., and funding implication of such a variety of programmes provision in an already strained NHS budget and limited staffing numbers [11].

These principles were developed into scoring tool used in this study to evaluate and identify best-fit program for selection that is identified as per (**Figures 5, 6 and 7**) to be DESMOND with a score point of 44 out of the possible 50 points checklist self-developed for this study. The quality assurance of any program is vital to ensure its credibility and authenticity. One of such quality assurance considered vital in analysing the program structure here was whether a program had accreditation if so by who through the critical paper appraisal stage. There are certain problems with the use of a variety of CT2DSHE programs. One of these is that evidence suggests that to achieve sustained patients DSMS and T2DM knowledge improvement, the programme needs to be ongoing within the community [23]. This has practical implications for organizations such as the NHS for resources such as workforce and finance. The more variety there is, the more resources are required to be deployed. Therefore, give rise to organization's managers choosing to refrain from implementing these as result of the demands on them to make savings. Overall, the positive outcome nevertheless is the choice such variety offers to nurses, Midwives, communities and organizations from which to select on one side and for the patient is the access this would afford thus mitigating concerns for CT2DSHE programmes.

4.3. Identified CT2DSHE Program Appraisal

(**Figure 7**) shows the score each program received during evaluation while (**Table 5**) shows assessment of each program's strengths and weakness.

Table 5. Shows the program's strengths and weaknesses.

		Strengths	Weaknesses
1	DSME with Support from Peer Led or peer support or care giver and CHW[DSME With caregivers support as follow]	1. No negative views from participants on having caregiver in the sessions. 2. Caregivers are thought to increase patient's adherence/compliance to sustaining diabetic self-behaviours of health eating and physical activities-(2 of the Core Ms of LM behaviours). Put as a benefit. 3. Utilises the health belief model (HBM) that help to allow identification of desire d/ undesired behaviours enabling reinforcement to be made by patients and educators. 4. Based on accredited program {AADE) that incorporates the 4 Ms-(medications, meal-planning, Monitoring and movements).	1. Unclear role played by patient. 2. Program was done in private institution there unsure of its integrity and validity of this results. 3. Reports of caregivers nagging patients whom they are support—paper report only x 1 participant mentioned this. 4. Unclear if participant were to be followed on a long term would retain these views then.
	[DSME With Community health worker-[CHW] support as follow	1. Utilising motivational theories. 2. Based on scholarly evidence. 3. Emphasis on contextual factors as given by the integrative model of behaviour change prediction-[IMBP]. 4. Its promotion of clear communication when delivering education activities between learners and educators to iron out any misunderstanding. 5. Promotion of patient empowerment approaches and social cognitive theory principles covering-Content that includes-diabetes specific content and behavioural change principles. Which are ideal for knowledge acquisition, improvement, retention and retrieval.	1. Research reports that supervision was poor of CHW peer support impacting on any positive aspects of evidence. 2. Lack of consistency in subject background knowledge of participants or use of said theories or model. 3. Use of historical institutional records - thereby posing issues of data input as to its suitability for a research purpose as well as its quality or its intended org use. 4. Results were based on self-reports based on their logbooks again posing issues of reliability and credibility nature. 5. Based on limited research evidence.
	[Gestation Diabetic manage-ment-(GDM) -DSME With Community health worker-[CHW] support during re-search]	1. Context based on ethnicity/or race with aspects of inclusiveness nature therefore rendering itself to be used in any community setting. 2. Education provision commenced on diagnosis stage content focused on dos and don'ts of diabetes health can be described as awareness or learning. 3. Content—Support of CHW valued by participants in form of psychological and emotional made available in the acute [A&E environment]. 4. Emphasis on patient-educator relationship and communication.	1. Content reported to be not cultural/or race reflective of selected sample group therefore impacting on results. 2. Inadequate sample size. 3. Historical data therefore evidence generated may not reflect current practice or evidence may be outdated.

Continued

	DSME With PL + CHW support as follow]	1. Use of empirical data. 2. Based on tested evidence of PL + CHW support model that is effective in real-world and PL+CHW being trusted by communities as they are part of them (patient/support families) therefore likely to appeal to patient and being accepted. 3. PL + CHW's sharing of characteristics with patients. 4. Based on adapted DSME curriculum from diabetes prevention program using community based participatory approach.	1. Concerns of underestimating economic benefits/education from the research. 2. Use of hybrid model still need further evaluation (PL + CHW). 3. Sample size was small and large sample size is needed to help conduct large clinical trial. 4. Study was only based on Latino adults with T2DM in low-income area.
2	**Desmond program**	1. Evidence based that supports psychosocial and lifestyle outcomes improvement (LM). 2. Based on structured curriculum that is underpinned by multiple learning theories [theory names not given]. 3. Supports patient's empowerment, beliefs and circumstances as well as risk factors as to participant SMART action planning process aimed at building self-efficacy around behavioural change to achieve. 4. A form of person-centered approach focused on activation, self-efficacy and engagement rather than on traditional compliance orientated medical model. 5. Encourages a shared decision-making on patient health that affect them and their finances-(health costs). 6. Facilitated by multi-disciplinary health professional (educators) with formal training. 7. Quality assured both internal and external to ensure consistency. 8. Concerns were raised that some participant may have earlier attended some form of DSME either with diabetic educators or dietician and therefore had time to develop a greater knowledge base and skill levels for self-management of their diabetes resulting in the registered higher degree of activation [though strange finding which could be interpreted to be positive that CT2DSHE is sustained over a longer period].	1. Lack of control group comparison and follow-up study to ascertain its claim. 2. DSME's effectiveness in increasing patient activation has not been verified in a routine real-world setting. 3. Its long term patient activation effects have not been verified and are not possible to ascertain. 4. Findings of positive effect results of DESMOND on Biomedical plus lifestyles outcomes were not sustained overtime. 5. Sample size was small. 6. Large proportion of participant scored high in activation levels prior to DESMOND participation. 7. Concerns were raised that some participant may have earlier attended some form of DSME either with diabetic educators or dietician and therefore had time to develop a greater knowledge base and skill levels for self-management of their diabetes resulting in the registered higher degree of activation [though strange finding which could be interpreted to be positive that CT2DSHE is sustained over a longer period]. 8. Less is known about how an individual's activation level can be increased, although person centered focusing on skill mastery, building confidence and problem-solving are thought to be most effective in increasing patient activation.

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3	**Peer support only**	1. Content [Curriculum] includes education, emotional and wellbeing support, help with selfcare, self-management (LM) and social support. 2. Based on proven evidence in supporting patient in Self-management activities (LM) and peer support model is on the rise in UK. 3. Its potential to both a long term and low cost as well as being person-centered in model of CT2DSHE in supporting people to manage their own health-potential to reduce costs for organisations and maximise support of patients in the community. 4. Peer support as module provides varied structures of provision/delivery content based on its degree of structure offers opportunity for catering for a diverse community/population.	1. Evidence on long-term support is limited with many studies focusing on short-term interventions of up to 3 - 6 months only and its use in minority communities is limited as well. 2. Evidence of peer support was found to be inconclusive. 3. Uncertainty that peer support program like other health researched models may fail to recruit or be available to those most in need. 4. The usefulness of peer support to inform commissioning or delivery in particular context or population is less certain due to multiple or variety of peer support models available in terms content underlying/actual intended outcomes. 5. Some of the gathered article evidence were done in acute setting and also no existing evidence of effectiveness of peer support in health and social care was found.
4	**Community-based health education on lifestyle modification-[CBHE-LM)**	1. CBHE-LM is based on evidence of life modification (LM) known to improve clinical and metabolic outcomes and contributes to reducing T2DM complications., e.g. MetS, raised blood pressures (BP) and lipid levels. 2. Content and Methods: Uses these strategies; Awareness creation-[Knowledge acquisition] of healthy lifestyle premised on diet, exercise cessation of smoking, alcohol consumption reduction and linkage to health facility when diagnosis is med (Use of the 4 Ms evident here). 3. CBHE-LM is built on clearly defined DASH diet program and Time length (LM). 4. With proven reliability as has been tested,	1. Evidence of this program's effectiveness of the strategy who's hallmark is LM is described to be limited. 2. This study on CBHE-LM states that no rigorous studies that had adopted RCT approach to test the most effective approach of addressing MetS in Kenya. However also states that its basis is only premised on RCT-design with observed change. 3. Based on study with limitation due to minor issues of the subjective measurement of food intake and physical activities that participant may have introduced recall/reporting bias.

Continued

5	**MOBILE assisted app**	1. Based on website-based adopted methods and theoretical frameworks of 'The SWAP-DM2) in providing Diabetic prevention services-[DSME]-CT2DSHE". 2. Content includes Diabetic awareness, record keeping, self-directed learning via website, risk scoring, and individualised counselling. [this Alive-PD was fully automated, flexible online behaviour change strategy in nature. Thereby promoting knowledge acquisition plus lifestyle modification resulting improve in clinical and behavioural changes. 3. Messages were based on Theory of Planned Behavioural change [Bandura's self-efficacy: towards a unifying theory of behaviour change]. 4. Leads to development of patients engagement in behaviours (life modification) via apps ideal to achieve T2DM control and improve quality of life by preventing complications, improved communication support and remote use between patients and healthcare educators - app being virtual/or automated-provides feedback and data visualisation. 5. Is a form of person centered based care provision that can be individualised in reminders and goal settings. 6. Risk of bias in papers assessed using Cochrane collaborative tool. 7. Increased mobile device ownership with added benefit to reducing expenditure on transports costs to educational centres and increasing networking /sharing experiences via apps.	1. Finding of that SMS and mobile apps did not significantly reduce incidence of T2DM. 2. Literature-based evidence that mobile health intervention on other conditions yielded inconsistence results, the evidence remains weak and not sufficiently proven and was with mixed results. 3. No significant differences were found between interventions and control groups for T2DM patients. 4. Apps for diet, physical activity and body weight monitoring yielded limited efficacy that were attributed to patient's perceptions of thinking these to be less relevant to effects of T2DM—as result the patient's use of these features or their engagement in these behaviour could be weak or may not be easy for patient to engage in them in long term. 5. Evidence in this study suggests that mobile apps have paid less attention to other important variables for CT2DSHE effectiveness determinants such as behaviours, knowledge and psychosocial outcomes. 6. Little is known about features of such technology that are effective at improving blood glucose (BG) levels.
6	**Multicomponent educational intervention program [MEIP]**	1. Based on structured on the principles of therapeutic education. 2. Evidence supports its effective to patient achieving metabolic control by reducing HbA1C [through lifestyle modification promotion—(e.g. diet adherence)—Reported based on proven evidence in addressing healthy lifestyle and self-management care activities NB based on statistical value. 3. Focussed on delivering DSME so participants acquires knowledge and skills [Empowerment, Independence and or autonomy [activation] to perform self-care activities of the 4 Ms-(medications, meal-planning, Monitoring and movements)	1. Study had significant disparities on HbA1C at baseline plus literature in this study pointed that there were several variable that can interfere process of arriving at results of HbA1C. 2. Went on to states that these can be associated with clinical metrics such as HbA1C in people with T2DM. 3. There are limitation to this approach affecting interpretation of results related to baseline differences in HbA1C. 4. There was also an aleatory patient distribution into groups necessitating further exploration of the approach before any implementation in real-world setting.

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Multicomponent educational intervention program [MEIP]	4. Prepared and delivered by trained health professionals in CT2DSHE. 5. Group-based approach incorporating diabetic educators and patients - promoting mutuality aiming to trigger to motivate pair discussions. 6. Content [Curriculum] organised sequentially globally and schematically described.	5. Study also found that there was little evidence on therapeutic education being effective approach to adopting [for CT2DSHE] as Strategy in Portuguese community.

Taken together, these findings does support strong recommendations to adopt DESMOND and DSME with [PL, Care giver, CHW and PS] for CT2DSHE going forward. The analysis of CT2DSHE undertaken here has extended our knowledge of DESMOND. How, DESMOND appears to address and answer the question on how long a patient is able to retain learned skills and knowledge when it's reported as "that concerns were raised that some participant may have earlier attended some form of DSME either with diabetic educators or dietician and therefore had time to develop a greater knowledge base and skill levels for self-management of their diabetes resulting in the registered higher degree of activation." This finding was unexpected and suggests that CT2DSHE is sustained over a longer period [20]. Three other authors add their voices to this argument [11] [16] [19]. Like DSME with support, DESMOND, these programmes are Context-based e.g., ethnicity/or race with aspects of inclusiveness in nature therefore rendering themselves to be ideal for any community setting [14].

The criticism with DSME is that it makes it difficult for implementations on account of funding and staffing perspective due to varied nature. Secondly DSME with support is associated with what has been described as supporters are reported to be nagging T2DM patients which is contrary to the notion of patient empowerment a value of person-centered care [21]. Contrary to expectations, DESMOND also lacked control group comparison and follow-up study to ascertain its claim of effectiveness and goes on to say effectiveness in increasing patient activation has not been verified in a routine real-world setting [20].

For this systematic review, despite criticism of these programmes, it should be highlighted that DESMOND remains the most suitable, because of easy to implementation, type of curriculum, educators and more importantly "DESMOND recognizes that people have an active role in managing their health by making shared decisions that affect their health and health care costs," supporting patients empowerments in their own care [20]. Is one of four programs (**Figure 6**) supporting T2DM awareness promotion among T2DM patients.

5. Limitation of This Study

Time spent on reviewing and writing this piece of work was challenging because as a working individual as well as studying, there was an element of competing demands between studying and working therefore deeper scrutiny of literature

was made impossible. Secondly being the first piece of writing a journal article, the author felt to have "limited skills for appraising and applying the evidence to a completed piece of this systematic review," as suggested by [27]. Only two [19] [22] of the eleven studies had control groups in this study in respect to intervention evaluation.

The strength of this systematic review is that despite the identified limitations, the study findings are backed up by previous studies on clinical metric changes as determinant for a program's effectiveness. Secondly the evidence reported is based on current research studies conducted within the last five years. This is despite the effects of the recent COVID-19 pandemic.

6. Recommendation

DESMOND scored 44 points out of 50 available points [**Figure 7**], showed longer lasting educational impact among T2DM patients and is person-centered in approach. There is, therefore, a definite reason for its request to be adopted by the NHS in the community.

7. Conclusion

This study set out to explore "Type 2 diabetic structured health education within a community, how effective is it?" The empirical findings in this study provide a new understanding of CT2DSHE's effectiveness as backed by [11] [14] [18]-[22], who base their arguments on three outcomes namely, a) Lifestyle modification: contributing to patients controlling clinical metrics e.g., SBG and HbA1C, b) Knowledge gain., T2DM patients showed understanding that if condition is not well-managed can lead to serious T2DM complications, e.g., blindness and hospital admissions, etc. and c) Perception Change. After exposure to CT2DSHE, T2DM patients' views were reported to have changed in the way they viewed T2DM. While three papers [13], [15] and [16] disagree that CT2DSHE programmes were effective and one [17] was neutral. These findings have significant implications for the understanding of "How" effective CT2DSHE is because of the suggestion of high patient's activation leading to them being able to develop deeper understanding and better management of their diabetes, all because they have become better at utilising their knowledge and skills after exposure to CT2DSHE programmes such as DESMOND [20]. This view is further supported by [11] [16] [19] who argue that educational effect and impact on T2DM patients can last long. What is interesting in this study findings is the variability of CT2DSHE programmes and how they are structured and delivered obtained from four theme analysis. CT2DSHE programmes based on this evidence can be said to be somewhat effective and last longer than earlier thought.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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