ISSN 2475-5451

Research Article

International Journal of Diabetes & Metabolic Disorders

The Impacts of Pharmacological and Other Interventions for Preventing the Onset of Diabetes

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Submitted: 19 Dec 2022; **Accepted**: 26 Dec 2022; **Published**: 02 Jan 2023

Citation: Ayodele Oluwole Ojebiyi. (2023). The Impacts of Pharmacological and Other Interventions for Preventing the Onset of Diabetes. *Int J Diabetes MetabDisord*, 8(1), 268-276.

Abstract

Owing to over 600 million persons globally facing complications of diabetes, researchers on daily basis are exploring various interventions to prevent individuals of all ages from developing the disease. Pharmacology as well as other interventions like counselling therapy, and cognitive are used to delay the onset of diabetes. Diet, physical exercise and medications are the best means to effectively lower blood sugar levels among diabetic patients. Endocrinologists believe interventions improve quality of life and often work by delaying the onset of diabetes. The objective of this study is to determine whether pharmacological and psychological interventions could prevent the onset of diabetes. Cochrane Endocrine and Metabolic Register of Studies up to 15 September 2022 using search terms relevant to this review were reviewed. The study also conducts searches in Embase, Medline, Cochrane Library, Cinahl, Web of Science, International Pharmaceutical Abstracts, American Journal of Clinical Nutrition, and Journal of the American Diabetic Association just to mention but a few. Qualitative method for data collection. The result shows that diets, exercise, glucose monitoring and reduction in weight could be used in delaying the onset of diabetes. Some studies were excluded simply because they did not meet inclusion criteria while the risk of bias was included in the studies.

Introduction

Several studies have shown that approximately 415 million adults globally are experiencing diabetes which is the commonest long-term medical condition. Persons with type 2 diabetes constitute 90% of the said figure and are said to develop associated complications like heart attacks or strokes and by 2035, almost 600 million persons globally will have DM (IDF 2017). Pao-Yu, Lee, Chieh-Yu and Lee (2021) say young people may have had other health problems, which made diabetes management a complex process since T2D from inception a chronic disease. People with severe mental health illnesses are likely to develop diabetes more than those without mental health problems. Ferrier, Ski, Casey, Jenkins, Thompson et. al. (2021) argue that mental health problems are highly prevalent in persons with type 1 diabetes mellitus (T1DM), which adversely impact physical well-being and quality of life. Side effects of antipsychotic medication as well as inadequate 'lifestyle' like poor diet and low levels of physical activity are factors responsible for this. Barbu, Popescu, Popescu, Serban-Mihai (2022) Diabetes can be both a product of inflammation and a co-factor implicated in the progression of vascular disease. About 8% of individuals with diabetes in the UK have type 1 diabetes, a severe and lifelong condition. Diabetes patients suffer either chronic complications which involve eye complications (retinopathy) individuals with such diabetes advance to what is known as diabetic retinopathy (eye disease) which is likely to affect a person's eyesight. Dickinson (2000) says adolescent females with type 1 diabetes are at risk for long-term complications including retinopathy, nephropathy, and neuropathy. Diabetes foot problems (nerve damage affects a person's feet and increased blood sugar which destroys the circulation, thereby sores and cuts become difficult to heal. For quite blood vessels can be destroyed by high blood sugar resulting in stroke and heart attacks. Over a period of time, kidneys could be damaged by diabetes thereby making it difficult to clear excess fluid and waste from person's body which is called nephropathy i.e. kidney diseases caused by high blood pressure and high blood sugar levels. High blood sugar levels cause nerve damage (neuropathy) in certain diabetic persons which makes it difficult for the nerves to convey messages from the brain to all part of the person's body which affect how a person perceives, hear, senses and travel. Certain cancers could be developed by a diabetic patient who is often at risk. Diabetes are affected by certain cancer treatment and make it difficult to regulate person blood sugar. High blood sugar causes a urinary tract infection in women's sexuality. A man may have sexual problems when there is difficulty getting aroused due to restrictions on the quantity of blood flowing to his sexual organs. Impotency may arrive as a result of erectile dysfunction. Poor glycaemic control (Lustman, 2000) and diabetic problems (De Groot, 2001), onset of diabetes associated with suc-

cessive depression (Mezuk, 2008), and depression associated with an enlarged risk of T2DM (Nouwen,2010). Diabetes healthcare teams such as practice nurses, dialectologists or endocrinologists, registered dietitians, registered podiatrists (foot specialists), an eye doctor (ophthalmologist), pharmacists, psychologists (emotional effect of diabetes-stress, feeling low and depressed, or burnt out) often take care of the patients.

Psychological interventions include cognitive behavioural strategies, counselling therapy, newer techniques such as positive psychology and acceptance commitment therapy both derived from cognitive behavioural therapy (CBT), psychotherapy techniques such as motivational interviewing (Goldbeck, 2014; Ismail, 2004). To reduce person, the hazard of developing complications; keeping blood pressure, blood sugar, and blood fats under control will immensely assist. Hung (2021) suggests that Type 2 diabetic patients with fixed work locations should be advised to consume home-prepared meals during work hours; while other employed patients should be equipped with the skills to maintain a healthy diet while eating out. With a view for diabetic patients to maintain healthy balanced diets, foods such as whole grains like brown rice, wholemeal flour, wholewheat pasta, wholegrain bread and oats are good for reducing diabetes. Other healthy sources of carbs are fruits and vegetable pulses like as chickpeas, beans and lentils dairies such as unsweetened yoghurt, cheese and milk as well as considering carbohydrate portion sizes. Fruits like apples, grapes, berries, and green leafy vegetables like spinach, kale, and watercress are good. Getting proteins from eggs, fish, beans and lentils, unsalted nuts, and chicken and turkey.

Individuals' hearts are protected by oily fish such as salmon and mackerel are rich in omega-3. Increased fibre carbs, white bread, sugary breakfast cereals and white rice called refined carbs are as a result of increased risk of type 2 diabetes. Consuming more red and processed meats such as beef and lamb, sausages, pork, bacon, and ham likely caused by increased risk of type 2 diabetes. Also associated with heart complications and certain kinds of cancer is excess alcohol intake enhances the increased risk of type 2 diabetes due to the high calories it. Exercising, getting off the bus further away from your destination, taking the stairs instead of the escalator, cycling, walking, starting yoga, swimming, skipping, and bowls avert high blood sugar. Jamal, Jaradat, Qadoumi, and Abdel (2021) suggested that the regular 16 weeks of swimming sessions could be considered non-pharmacological approaches to managing diabetes. Dancing is exercise, so remember that it can make your blood sugar levels drop. Losing weight by doing a brisk walk around the park, playing a sport in the garden, or doing an online exercise class leading to the management of a person's cholesterol, blood pressure and blood sugar level. Bellido and Perez (2021) found the likelihood of patient education and enlightenment programmes of reducing the risk of diabetes-related complications. Constant usage of computers assists patients which is one area of helping many more individuals to learn about self-management.

Ensure you check your blood sugar level in the morning because some hangover symptoms (like headache, feeling sick, sweating and shaking) are similar to the symptoms of hypo. Rebeca and DeBoer (2021) advocated the reduction of obesity and insulin resistance. Lifestyle modification, with increases in physical activity and dietary improvements, metformin treatment for more moderate cases of prediabetes to bariatric surgery for adolescents with severe obesity and comorbidities. People should reduce salt in their diet, give up smoking, drink less alcohol, try other means to cope with stress, and have less caffeine. Metformin is used for people with Type 2 diabetes to manage their blood sugar levels. Medication like sulphonyl ureas stimulates the pancreas to produce insulin. Metformin is a medication that helps the insulin you produce work better. Metformin comes in brands like Bolamyn, Diament, Glucient, Glucophage, and Metabet. Once you begin to take metformin, no end date. Feeling sick or having diarrhoea are common metformin side effects.

Metformin helps in lowering cholesterol levels and reducing heart disease risk. Knight (2003) showed education whilst necessary, is not sufficient to bring about behaviour change, psychosocial interventions to help young adults improve their self-care are urgently needed. Cognitive behavioural therapy (CBT) has been effective in treating a variety of psychological disorders including diabetes which may assist patients to improve their HbA1c by changing the way they think and behave. Staying without consuming alcohol at all for some days in a week. Taking excess alcohol two days a week is likely to escalate the danger of other health situations like certain kinds of cancer. Interventions may involve psycho-education, supportive therapy, counselling, and other simple behaviour. Studies have shown that certain drugs which suppress immunity can halt the destruction of the beta cell of the pancreas. Also, researches show breastfeeding reduces the risk in later life and the early introduction of gluten-containing cereals in the diet increases the risk of developing pancreas islet cell autoantibodies leading to diabetes. Monitoring glucose and managing diabetes could be easier with Guardian Connect, Dexcom G5, Abbott Navigator, and Medtrum A6. Diet and Exercise, regular therapy, injections, self-monitoring, self-adjustment of the treatment, and clinic visits.

In preventing the onset of diabetes, the health belief model (HBM) developed by Irwin M. Rosenstock is a psychological health behaviour change model which explains and predicts health-related behaviours. The model understands the failure of pre-diabetic and diabetic patients to adopt disease prevention strategies. Individuals' perception of four serious areas include the person's susceptibility to that illness; severity of a potential illness; the barriers to taking that action; the benefits of taking preventive action in which peoples' health-related hang on as recommended by HBM. Perceived Susceptibility when diabetic patients not taking their medications often or non-diabetic patients are not going for diabetic screening tests when necessary to ascertain their health status.

Individuals are more likely to engage in risky behaviours when they are of the view they are at low risk of developing a disease as predicted by HB model. For instance, an individual who based

on family history believes he is a likely candidate for diabetes disease is more likely to pay attention to psychoeducation and public enlightenment programmes to reduce the risk of diabetes disease. Perceived severity is when pre-diabetic and diabetic patients believe that diabetes is a chronic disease and could result in untimely death if it is not well managed. The model believes in the significance of a condition and its drawbacks such as discomfort, infirmity, death etc. For instance, it's unlikely to make major diet changes if diabetic person is not expressing any symptoms having diagnosed with diabetes. Perceived threat is when individuals feel that he is at risk because his/her family diagnose with diabetes e.g. type 1 diabetes. Even if an individual perceives a health situation as frightening and believes that a particular action will effectively reduce the threat, the barrier to acting includes expense, the perceived inconvenience, danger (e.g. side effects of a medical procedure) and discomfort (e.g. pain) involved in engaging in the behaviour. Perceived severity + perceived susceptibility = Perceived threat. Cue to Action when various enlightenment programmes, and psycho-education among others explain the need for preventing diabetes.

Television is used as a factor that activate readiness to change. A cue is necessary for prompting engagement in health-promoting behaviour as suggested by HBM. Pain, symptoms are examples of internal cues while information from health care workers are good example of external cues. Perceived Benefits-Metformin and other interventions are easy to use and make people feel good. In expressing the desired behaviour, diabetic patients often buy and use metformin and other interventions. An individual believes that a particular action will reduce susceptibility to a health problem or decrease its seriousness, facts regarding the effectiveness of the action. Individual belief about the advantage of being involved in certain health behaviour. Self-efficacy when diabetic patients have been educated and enlightened on the importance of taking medications and other interventions which means confidence in one's ability to act. Non-account for a person's attitudes, beliefs, or other individual factors that dictate a person's acceptance of health behaviour are the drawbacks of this model. It's important to choose healthier foods, take unsalted nuts, olive oil, rapeseed oil, sunflower oil, avocados, and seeds instead of crisps, chips, biscuits, sweets and chocolates and be mindful of the portion because of your weight. Interventions are meant to improve the quality of life and improve life quality, endocrinologists often work by delaying the onset of diabetes. Physical exercise, weight loss and lifestyle modifications have proven to delay the onset and progression of diabetes. However, 56% non-compliance to lifestyle modifications for diabetes was estimated in a study. It might be difficult to attain and preserve over time the efficiency of weight loss in converting prediabetes to type 2 diabetes. This necessitated the consideration of pharmacological and other interventions in preventing the onset of diabetes.

OBJECTIVES

To determine whether pharmacological and psychological interventions can delay the onset of diabetes

RESEARCH QUESTIONS

Diabetes symptoms occur because some or all of the glucose stays in the blood, and isn't being used as fuel for energy. The body lowers blood glucose levels by eliminating the excess glucose out of a person's body in form of urine thereby making one thirstier. Diabetes can have an additional effect on the illness and the illness can impact diabetes, therefore people could be admitted to hospitals. Different kinds of diabetes are type 1 diabetes, type 2 diabetes, Maturity onset diabetes of the young(MODY), Gestational diabetes, Wolfram syndrome, Neonatal diabetes, Latent Autoimmune diabetes in Adults (LADA), Alstrom syndrome, Type 3c diabetes, Steroid-induced diabetes, and Cystic fibrosis diabetes.

Do pharmacological and other interventions help in preventing the onset of diabetes?
Methodology & Research Design.

Randomised controlled clinical trials (RCTs) of any length of treatment and any length of follow-up. Eligible are both individually and cluster-randomised clinical trials. Studies that reported full text, those published as abstract only, and unpublished data were also included. Data collected by qualitative methods like focus group discussions, interviews, and observations, using qualitative methods for data analysis were included. Also excluded were data gathered using qualitative methods but did not carry out a qualitative analysis, for instance, open-ended survey questions where replies were analysed using descriptive statistics. Included were mixed-methods studies deem likely to extract data resulting from qualitative methods. Also, included in this study are healthy individuals and individuals with at least one major risk factor for type 1 & 2 diabetes. Abdominal obesity, overweight, impaired glucose tolerance and insulin resistance are major risk factors. Adolescents and children, below age 18 were excluded due to discrepancies in eating patterns.

For individuals with Type1 and 2 diabetes and those without these diseases but one of the underlying conditions of diabetes and the diagnosis should have been established using the standard criteria valid at the time of the beginning of the trial (ADA 1997; ADA 1999; NDDG 1979; Unwin 2002; WHO 1980; WHO 1985; WHO 1999). When a body mass index is more than 25 (body mass in kg/height in (m2)), a person is said to be overweight (FAO/WHO 2003). In men, waist circumference is equal to or higher than 102 cm in men and in women, equal to or higher than 88 cm (FAO/WHO 2003) which means abdominal obesity. According to the (WHO, 1999), under hyperinsulinemic, euglycemic conditions, glucose uptake below the lowest quartile for the background population under investigation is said to be insulin resistance. Psychological interventions comprise of CBT, psychodynamic psychotherapy, IPT, non-directive or supportive therapy and counselling (Davison 2003) are different kinds of interventions, acceptance and commitment therapy, mindfulness-based cognitive therapy, mindfulness-based stress reduction, emotion-focused therapy, and metacognitive therapy (Australian Psychological Society, 2018). For this review, we chose to focus on the most representative psy-

chological therapy schools (i.e. CBT and its components or developments, psychodynamic psychological therapy, and supportive psychological therapy) and their control conditions.

Trials that compared psychological therapy with a pharmacological intervention were included. Psychological therapies such as Psycho-education mean patients are provided with information about their disease (Daele, 2012). Supportive psychological therapy in which patients are administered an active, although non-specific, psychological treatment (Douglas, 2008). As therapies could be of any length, we accepted those given in a single session. Individual and group therapies were included. Therapies administered in their self-help (e.g. book, computer, internet) or remote (e.g. telephone, video conference) versions were excluded as face-to-face is the best means of administering therapies. Couple therapy, family therapy, and other psychosocial interventions whose intervention focus is not on the individual but rather on the family system were excluded.

All psychological interventions were pooled together, conducted analyses of heterogeneity, and considered this when adjudicating the strength of evidence. The mode of delivery was defined as an individual, group, or family therapy carried out in whole or in part by a healthcare professional. The comparison group was defined as consistent with a similar review of type 1 diabetes interventions (Winkley, 2020): 'no intervention', 'usual care, 'wait-list control', 'attention-control' or 'clinical management (CM). Regarding differential or incremental effects of different treatment approaches, trials were considered with a control group receiving pharmacological treatment or another psychological treatment. Any medication provided for the primary purpose of preventing the onset of diabetes was included. Also included were studies that combined pharmacotherapy with other diabetes preventive strategies, including educational, behavioural, surgical interventions, or lifestyle (diet and exercise). Included were both medicine and over-the-counter drugs. Medications not approved for preventing diabetes, but were used for the primary purpose of preventing diabetes were included. The interventions examined included comparison groups where additional studies that involved a comparison group with various interventions were added irrespective of the nature of the comparison intervention for the main purpose of determining which one is more effective than the other. Outcome types measures are quality of life, fasting blood sugar; non-drug-related morbidity; mortality.

For pertinent titles and abstracts, numerous electronic databases were vetted. No language restraints on the searches. In the review, conference proceedings and abstracts were incorporated but not in the primary pooled analysis because they had insufficient detail to assess the intervention and the quality of the study. Because of the difficulty to locate in full text, dissertations were excluded. As of September 15, 2022, electronic databases such as Medline, Cinahl, Embase, Web of Science, and Cochrane Library including Cochrane were searched. Other resources searched are the American Journal of Clinical Nutrition and; the Journal of the American Dietetic Association. Experts in the endocrinology field as well as some drug manufacturers were consulted. For searching and study inclusion, no language constraint was applied. To identify possible studies of interest, the reference lists of all included studies and review articles were screened.

The hand search of specialised journals was not done because the sensitivity of the electronic database search was enhanced by omitting study design restrictions and all pertinent journals were encompassed in the electronic databases. Duplicate publications were aimed to be identified by comparing publications of the same authors concerning study people, place, date and follow-up time of the study. Medical Subject Headings (MeSH) terms Diabetes, prevention, pharmacological, and other interventions were searched with all corresponding keywords, and relevant articles used. The minimum duration of interventions is six months for the trials. Cochrane Handbook for Systematic Reviews of Interventions was used as a risk of bias for each trial(Higgins 2011). Any disagreement was resolved. Random sequence generation; allocation concealment, incomplete outcome data, selective reporting. Population: Individuals at risk of developing type 1 or 2 Diabetes; Maturity Onset. Interventions are pharmaceutical preparation; Metformin; Alpha-glucosidase inhibitors; incretins (acarbose, digital, voglibose, and pioglitaZone); pramlintide; and sodium-glucose cotransporter 2 inhibitors; educational programmes; problems solving training; motivational intervening; glucose monitoring, psycho-educational intervention; systemic intervention; diet and exercise; self-monitoring; bromocriptine, Clinic visits; Self-adjustment; education, coach; social support to improve the onset of diabetes; medication adherence; diet, physical activity; weight management; Physical exercise therapy; monitoring carbohydrate intakes Outcome (Prevention): Primary prevention; Diseases prevention; emotional health; weight loss; lower blood pressure; normal lipids; vitamin D, death, morbidity, Stroke, heart failure. Comparison: Healthy eating; Regular exercise, Weight loss; Insulin therapy; Blood sugar monitoring; Cut sugar and refined carbohydrates from your diet, Drink water; Take fibre; Be more physically active; Eat healthy fats; Skip fad diets and make healthier choices; were all added to decide which interventions were more effective than others. Inclusion Criteria-All studies with non-diabetic and pre-diabetics; Observational and experimental studies; Studies published in the English language. Exclusion Criteria-Poor-quality studies; Studies published in languages apart from English; Studies that suggestively include patients already diagnosed with either type I or II diabetes; Ongoing clinical. All medications not certified by regulatory bodies like NAFDAC in Nigeria including herbal supplements and medicine not regulated by NAFDAC. Data extraction and management. Relevant data were abstracted for studies that fulfilled inclusion criteria. No evidence that such blinding reduces bias in conducting systematic reviews and meta-analyses as extraction was not blinded (Berlin, 1997; Irwig, 1994).

Assessment of risk of bias encompassed studies using statistical pooling where data from RCTs were thought to be suitably identical concerning interventions and results, and collective effect sizes were calculated. According to (FAO/WHO 2003), a body mass in-

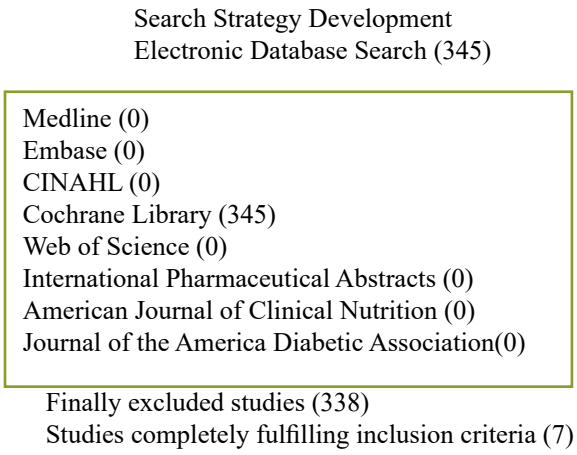
dex exceeding 25 (body mass in kg/height in (m2)) is overweight and has a great side impact on diabetes. To reduce the potential impact of bias on my outcome, the review of the effectiveness of randomized controlled trials only were included. The prospective for bias from difficult and worldly developments in studies without randomization was recognized, but because observational studies yield vital information on contrary events associated to treatment, predominantly on rare, long-term side effects were explored and synthesized in narrative form (Elphick, 2002). Both full-text publications and abstracts were included in this review. Data from these journals were analysed both independently and combined with full-text publications since it's harder to evaluate the quality of abstracts. Published data were inspected only.

The entire study addressed pharmacological and other several interventions about diabetes onset. Intervention types mean any medication that could avert the onset of diabetes was included also pharmacotherapy as well as weight loss methodologies, including behavioural, enlightening, and lifestyle (diet and exercise). Both prescription and over-the-counter drugs were included. Pharmacological therapy, metformin and TZDs are effective drugs in reducing the risk of T2DM in patients with Impaired Glucose Tolerance and higher BMI. Incretins are also capable drugs in patients with IGT, due to the reduction in postprandial glucose excursions demonstrated in studies with vildagliptin. Medication, Diet and Exercise are the three (3) cardinal rules necessary for better diabetes care. However, enlightenment and education is the most fundamental pillar in preventing diabetes and diabetes treatment in any society.

RESULTS

A list of titles and abstracts was examined. The full papers of all remaining articles were independently retrieved and reviewed. In addition, any other potentially relevant articles identified by checking the reference lists were also reviewed. This information was used to construct a PRISMA flow diagram and reported the reasons for the exclusion of excluded studies. Any disagreements were resolved by consensus discussion.

For Cochrane Library with 345studies found, no possible eligible studies were found in Medline, CINAHL as well as Embase. Having screened 345 possible eligible studies 7 were recognized and full text of these studies were achieved. Quite a number of the studies were excluded after a carefully detailed examination. These 7 full articles were extracted and independently accepted through the quality assessment to finally select a total of 7 articles that have been incorporated in the final review. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart for study selection.



The likelihood that certain publications were repeated was examined by comparing publications of the same authors concerning study populations, location, date and follow-up time of the study. No duplicate publications were identified. In total, 7 studies that met all the inclusion criteria were identified. For the design and period, all 7 studies were cohort studies. One had up to the duration of six weeks (Marion, Jaap, Rien & Roel, 2008), three lasted eight years (Koh-Banerjee, 2004; Schulze, 2004; van Dam 2006), and one study also had 12 to 57 weeks (Susan, Xuanping, Alison, Edward, Christopher, Joseph 2005), one had 6-36months (Emil, Kasper, Yuan, Ulrik, Bernd, Maria-Inti & Bianca, 2020). All participants were without a earlier diagnosis of diabetes in the review studies. 12 participants were obese and hyper-insulinemic (Marion, Jaap, Rien & Roel, 2008). 8918 women and 8709 infants reduced the risk of GDM in their diets & exercise in the intervention group (Emily, Judith, Joanna, Shanshan, Caroline & Philippa, 2017). In another study, 11,814 participants were involved and the study found that the acarbose group reduced T2DM incidence compared to the placebo (Suzanne, Peter, Reinier, Wim & Floris 2008). Alpha-Glucosidase Inhibitors (AGI) may prevent the development of T2DM in people with Impaired Glucose Tolerance (IGT). In another study, 944 participants of women were involved of which 600 were of Type 1 diabetes while 660 women were of Type 2 diabetes. In considering the outcome, five studies measured the effect of diets, physical exercise, continuous glucose monitoring and weight loss in preventing diabetes onset (Asif 2004; Marion, Jaap, Rien & Roel, 2008; Emily, Judith, Joanna, Shanshan & Philippa, 2017; Susan, Xuanping, Yuan, Ulrik, Bernd, Maria-In-

ti & Bianca, 2020). They all argued that diets, exercise, glucose monitoring and weight loss can be used in preventing the onset of diabetes. Helen, Declan, Caroline, Kirsty and Georgina, (2021) revealed no outcome in their study. Some studies were excluded simply because they did not meet inclusion criteria while the risk of bias was included in the studies.

Diabetes is prevented through early diagnosis, detection and treatment of diabetes complications. Individuals should ensure healthy lifestyle interventions based on appropriate education like patient-centred, structured self-management education, healthy diet, regular physical activity, alcohol, smoking avoidance, self-care and monitoring, drug therapy (oral/anti-diabetic drugs like insulin), and anti-platelet. Diabetes kidney disease (DKD) is prevented by watching diet carefully to maintain normal blood glucose and cholesterol levels as recommended by dieticians. Keeping a well-controlled blood pressure (BP) of less than 130/80mmHg with anti-hypertensive drugs as prescribed by the physician. Takashi, Yasukazu, Yukiko and Norio (2021) identified five pharmacological interventions (abaloparatide, alendronate, denosumab, raloxifene, and teriparatide).

Among patients with CKD stages 3-4, anti-osteoporotic drugs tend to lower the risk of vertebral fracture (RR 0.52, 95% CI 0.39 to 0.69; low certainty evidence). Anti-osteoporotic drugs probably make little or no difference to the risk of clinical fracture (RR 0.91, 95% CI 0.79 to 1.05; moderate certainty evidence) and contrary events (RR 0.99, 95% CI 0.98 to 1.00; moderate certainty evidence). It is uncertain whether anti-osteoporotic drug decreases the risk of death (RR 1.00, 95% CI 0.22 to 4.56; very low certainty evidence). Ensure low salt diets; the such patient should eat plantain (unripe) loaded with essential nutrients, weight reduction, alcohol avoidance and regular tolerable exercise. Kliger & Lynch (2003) Fiber, Whole grains, Dietary fats, Low Glycemic Index Diet. Macronutrient content of the diet of approximately 40% carbohydrates, 30% protein and 30% fat is commonly used, and calories can be adjusted accordingly as indicated. Exercise, Magnesium, Chromium, Vanadium, Alpha-lipoic acid, Soy, Fish oil, Bitter melon (Momordica charantia), Glucomannan, Psyllium, Aloe vera, Nopal (Optunia streptacantha), Gymnema (Gymnea sylvestre), Bilberry (Vaccinium myrtillus), Mind/Body Approaches. Measuring carbohydrate foods assist in controlling your blood glucose, while measuring your protein and fat foods helps manage your weight and blood cholesterol. Sanjay, Manash and Rakesh (2018) advocated the use of both psychosocial and bio-medical aspects of health. Salutogenesis should focus on comprehensive metabolic management, as opposed to glucose entered therapy. Salutogenic factors in diabetes care include lifestyle factors like regular exercise, moderate diet, and stress management; psychological factors such as emotional health, and diabetes distress; social factors like family support, diabetes friendly environment, and diabetes friendly society; biological factors like haemoglobin status; metabolic health such as blood pressure, weight, lipids, platelet health Concomitant infections/infestations, Endocrine health like Vitamin D, gonadal status, renin angiotensin system; Pharmacological factors such as Drug Safety, Drug tolerability, Drug efficacy. Souto, Souto, Daniel & Medina (2011) Pharmacological interventions-Incretin-based therapies (IBT) develop to address hyperglycemia, ensure Glucose-lowering and weight-reducing actions, IBT decrease systolic BP, increase fasting and postprandial lipid parameters, lessen high-sensitivity C-reactive protein levels, and increase endothelial dysfunction. IBT have several valuable effects on cardiovascular risk factors and use for diabetic patients with cardiovascular complications. Bariatric surgery is used in preventing T2DM. Laparoscopic adjustable gastric banding in patients with established diabetes resulted in remission of diabetes in 64% and major improvements in glycemic control in 26% which suggests surgery could also successfully avert diabetes.

The risk of developing diabetic retinopathy and vision loss can be prevented by: keeping blood glucose normal and blood glucose self-monitoring. Treating hypertension to keep blood pressure normal, keeping blood cholesterol level normal. Another eye problem linked with diabetes is cataracts which imply a rise in blood sugar level and causes cloudiness of the lens. Li, Li, Zhou, and Xiao (2022) found that Galectin-3 is an ideal therapeutic target, which has broad prospects in the prevention and treatment of diabetes and its complications, especially microvascular and microvascular complications. Fu-Shun and Chii-Min (2022) suggest energy-dense foods and sweetened beverages, physical inactivity, excessive TV watching or prolonged use of electronic products as factors likely to escalation the risk of metabolic syndrome and insulin resistance due to overweight in most adolescents with type 2 diabetes. Management of diabetes: oral medications 50%, diet 10%, Exercise 5%, sleep well 3%. Controlling blood glucose and blood pressure levels is the best way of preventing retinopathy and other diabetes complications like stroke, and heart and kidney failure.

Eating a healthy diet, living an active life, monitoring blood sugar levels and taking the right treatment can help reduce the risk of damage to the small blood vessels at the back of the eye. Physical exercise can lower blood pressure, help weight loss and improve diabetes control. Eating a healthy balanced diet can protect your cardiovascular system and prevent diabetes complications visit specialist dieticians for advice and support. Continuous glucose monitoring uses an implanted device to automatically monitor the blood sugar levels, every few minutes, 24 hours a day. Finger prick tests provide a snapshot of your blood glucose levels. Alva, Chakkalakal, Moin and Galaviz (2022) recommend National Diabetes Prevention Program as the most efficient diabetes prevention intervention. Li, Zhou and Erkang (2022).

Metformin has hypoglycemic effects, improve cognitive functions in some T2DM patients, and exerts beneficial effects on many neurological disorders, including major depressive disorder (MDD). Joseph (2022) Insulin secretion may be increased by consumption of the “modern” diet, over-nutrition, genetic background, decreased hepatic insulin clearance, and metabolic programming thereby causing chronic hyperinsulinemia. Kibiti and Afolayan

(2015) recommend sixty-five plants for use, fourteen hinder intestinal absorption of glucose, three exhibit insulin-mimetic properties, seventeen stimulate insulin secretion from pancreatic beta cells, twelve boost peripheral glucose uptake, one stimulates regeneration of beta-cell of islets of Langerhans, thirteen ameliorate oxidative stress and twenty induces hypoglycemic effect (mode of action is still obscure).

Thirteen of these plants have a duplicate mode of action while one of them has three modes of action. Vanadyl sulfate at a dose of 100 mg/day is effective in improving insulin sensitivity. Good sources of vanadium include seafood, mushrooms, olives, whole grain bread, carrots and vegetable oils. Zinc is an important trace element in diabetes. Zinc plays a vital role in the biosynthesis of nucleic acids, RNA polymerases, and DNA polymerases; hence its involvement in the healing processes of body tissues. Molybdenum (Mo) affects glucose metabolism. It enhances insulin receptor autophosphorylation and phosphorylation of its substrate and augments glucose transport, oxidation and lipogenesis in adipocytes. Molybdate is an effective antihyperglycemic agent. Mo proves to be an effective blood glucose-lowering agent in strictly diabetic patients. Iron influences insulin action. Iron interferes with insulin inhibition of glucose production by the liver. The body's ability to utilise glucose and decrease the insulin requirement is achieved by physical activity as well as exercise. Insulin therapy restores normoglycemia, and suppresses ketogenesis, delaying diabetic complications. Biguanides reduce plasma triglyceride and low-density lipoprotein (LDL)-cholesterol levels and reduce insulin resistance. Thiazolidinedione is a unique drug class of "insulin sensitizers" that promote skeletal muscle glucose uptake and to a much lesser extent, in the liver. Improve insulin sensitivity by changing hormone production by adipocytes. In preventing an autoimmune attack, plants used in the management of diabetes mellitus in Africa include Green tea is well-thought-out to be anti-inflammatory, antioxidative, antimutagenic, and anticarcinogenic and can prevent cardiac disorders. Epidemiologically, its consumption prevents type 2 diabetes. Onion (Allium cepa) and garlic (Allium sativum) contain active hypoglycemic constituents. Volatile oils in raw onion and garlic cloves decrease fasting glucose concentration in both diabetic animals and human subjects. Asif (2014) believes that minor modifications in your lifestyle can greatly lessen person chances of getting this diabetes disease.

The condition can be prohibited through adjustable factors that impact its development-lifestyle and dietary habits. However, with proper testing, treatment and lifestyle changes, healthy eating as a strategy, promoting walking, exercise, and other physical activities have beneficial effects on human health and prevention of diabetes, and promoting adherence to this pattern is of considerable public health significance. Intake of whole grain foods resulted in a slight improvement in insulin sensitivity and no adverse belongings (Marion, Jaap, Rien & Roel, 2008). Studies have linked the exposure of infants to cow's milk as a cause of diabetes. Other pancreatic problems, including trauma, pancreatitis, or tumours can be to the loss of insulin production. Once the insulin-producing beta cells of the pancreas are damaged, glucose is unable to move from the blood into the body cells resulting in the accumulation of sugar in the blood into the blood cells resulting in the accumulation of sugar in the blood. The body's cells become starved of glucose which it uses as fuel. The high level of glucose in the blood will lead to the clinical manifestations and complications of the disease which will develop rapidly over days. Ozana, Hruska and Sechi (2022) Type 1 diabetes is a multifactorial polygenic disease whose origin is conditioned by the mutual interaction of genetic and other factors.

Discussion

Only seven studies met the inclusion criteria. Numerous studies were let off from the review because the interventions involved a quite number of factors concentrated on a specific area. The encompassed studies were generally of poor quality with the majority having a high risk of bias. The main flaws were the small numbers, inadequate allocation concealment and lack of intention-to-threat analysis. The review of some studies examines the relationship between pharmacological as well as psychological interventions and the onset of diabetes of both type 1 and type 2 diabetes. It was revealed that minor changes in peoples' lifestyles could lower the possibilities of getting this diabetes disease which could be prevented through modifiable factors that influence the development of lifestyle and dietary habits (Asif, 2014). Proper testing, treatment and lifestyle changes, healthy eating as a strategy, advancement of human health and prevention of diabetes, and promoting faithfulness to this pattern are of considerable public health importance.

Taking whole grain foods resulted in a slight improvement in insulin sensitivity (Marion, Jaap, Rien & Roel, 2008). The trial was of short duration (minimum period needed for inclusion) with a lesser sample size. Susan, Xuanping, Alison, Edward, Christopher, Joseph (2005) Pharmacotherapy produces modest reductions in weight for fluoxetine (5.1 kg (95% confidence interval [CI], 3.3 - 6.9) at 24 to 26 weeks follow up; orlistat 2.0 kg (CI, 1.3 - 2.8) at 12 to 57 weeks' follow-up, and sibutramine 5.1 kg (CI, 3.2 - 7.0) at 12 to 52 weeks' follow-up. Glycated haemoglobin was also modestly and significantly reduced for fluoxetine and orlistat. Fluoxetine, orlistat, and sibutramine can achieve statistically significant weight loss over 12 to 57 weeks. Emily, Judith, Joanna, Shanshan, Caroline and Philippa (2017) There was evidence proof of less gestational weight gain in the diet and exercise intervention group compared with the control group (mean difference (MD) -0.89 kg, 95% CI -1.39 to -0.40; 5052 women; 16 RCTs; $Tau^2 = 0.37$; $I^2 = 43\%$; moderate-quality evidence). As seen in these studies, the use of pharmacological and other interventions tends to be associated with a healthier lifestyle thereby delaying the onset of diabetes.

One limitation of this study is the limited small number of the included studies considered which is seven out of 345 studies reviewed. Furukawa 2007 compared combination therapy with psychotherapy or pharmacotherapy. Their findings suggested that the effect of psychological treatment lasts longer than that of a

pharmacological treatment since psychological therapy plus pharmacological intervention did not increase the long-term response after the discontinuation of treatment compared with psychological therapy plus placebo (RR 0.96, 95% CI 0.79 to 1.16), whereas combination therapy was superior to pharmacological intervention alone in terms of remission/response after the discontinuation of treatment (RR 1.61, 95% CI 1.23 to 2.11).

The certainty of the evidence was graded using the GRADE approach (GRADE 2008). For patients with CKD stages 3-4, a vertebral fracture was assessed to be of low certainty owing to concerns of serious risks of bias and inconsistency. We assessed clinical fracture and adverse events to be of moderate certainty owing to concerns of serious risks of bias. For patients with CKD stages 5 and 5D, we assessed clinical fracture and death to be of very low certainty owing to concerns of serious risks of bias and serious imprecision.

The mean change in the BMD at the femoral neck was of very low certainty owing to concerns of serious risks of bias, inconsistency, and indirectness was also assessed. A comprehensive search using several different databases was performed. The possibility that smaller studies were missed cannot be ruled out. In addition, web searches were conducted to collect additional data, and concerns about the inability to obtain sufficient information. Potential bias due to data availability status. Many studies reviewed had an unclear risk of bias for random sequence generation, allocation concealment, and selective outcome reporting. The quality of the evidence was however downgraded.

Conclusion

The findings of this meta-analysis suggest that diets, physical exercise and medications are the best means to efficiently reduce blood sugar levels among diabetic patients. The health belief model has been applied as a useful tool for lifestyle change among people with type 1 and types 2 diabetes as well as individuals yet to be diagnosed or without the disease. Diabetes is one of the commonest chronic medical conditions, affecting over 600 million persons worldwide.

The disease could be prevented through early diagnosis, detection and treatment of complications arising from diabetes. A micro-nutrient content of carbohydrates, protein and fat in 40%, 30% and 30% is hereby recommended aimed at controlling blood sugar levels in our body. It's revealed that an increase in sugar levels in the blood will lead to complications of diabetes disease. Rapid changes in an individual's lifestyle could reduce the possibilities of getting diabetes which can be delayed via modifiable factors such as pharmacological and other interventions linked with a healthier lifestyle. Future research could look into the roles of telemedicine in the management of DM patients [1-23].

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