

## Prevalence, Determinants and Prevention of Type 2 Diabetes Mellitus (T2DM) in Arabic Countries: A Systematic Review Study

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### Abstract

**Introduction:** Type 2 Diabetes Mellitus (T2DM) is becoming one of the main highlighted issues by the World Health Organization (WHO) especially concerning people in developing countries. In the Arabic countries like other developing countries, the prevalence of T2DM is increasing. This systematic review aimed to determine the prevalence, determinants and risk factors as well as preventative strategies used for T2DM amongst Arabic nations.

**Methodology:** This systematic review was conducted with the usage of 5 different electronic databases which includes Scopus, Google scholar, CINAHL, Medline, and PubMed. Articles published between 2000 and 2015 and in English language were included in this study. The keywords that were used to search in the databases included "Type 2 Diabetes Mellitus" AND "prevention" AND "prevalence" AND "determinants OR risk factor" AND "Arabic countries OR nations". All the relevant articles were reviewed and a data extraction sheet was made for the analysis.

**Results:** Twenty five studies met the inclusion and exclusion criteria. Majority of studies focused on both male and female (18 studies) and those who aged 20-50 years old (8 studies). Saudi Arabia had the highest frequency of studies on T2DM which was a total of 5 studies. The results also showed that the prevalence of T2D rates from 1.3% to over 50%. Furthermore, having an unhealthy lifestyle such as poor diet and nutrition/ lack of physical activity was the most common determinant within the population, communities and hospital-based settings especially. The highest risk factors are stroke, high blood pressure and negligence towards healthy living.

**Conclusion:** The results of the study highlighted different prevalence of T2DM and its main determinants as well as the risk factors. This result would aid in the compilation of a framework for public health officers and stakeholders to focus on the different possible ways to reduce the contraction of T2DM.

**Keywords:** Type 2 diabetes mellitus; Prevalence; Determinants; Prevention; Arabic countries

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### Introduction

Diabetes is one of the most common public health problem in both developed and developing countries [1,2]. The prevalence of Type 2 Diabetes Mellitus (T2DM) is increasing and alarming causing threat to the population around the globe [3]. According to the World Health Organization (WHO) the prevalence of diabetes will double by 2030 [4]. There are three types of diabetes. Type 1 is an auto immune disease where pancreases produce little or no insulin at all. T2DM is a lifestyle disease because it is triggered by obesity, physical inactivity and sedentary lifestyle and type 3

is a condition specific to women when they are pregnant and it disappears after birth [5,6]. It is said that T2DM is the end stages of diabetes where it mostly affects people later in their lives or it can be hereditary to or for some rare cases where it will affect some in their younger years [7,8].

Sedentary lifestyle with low/zero amounts of physical exercise is a huge contributing factor to fat build up in the body [9]. This could be prevented through living a healthy life style. Study shows that most individuals, mainly Arabic people that are newly diagnosed have a high income making them more prone to obesity which is

a contributing factor to T2DM [10]. The other research shows that people are provided with self-monitoring blood glucose to detect hypoglycemia. Therefore, there will be little need for people to take care of their diet since they can just monitor their glucose level [11]. It also talks about the under testing and over testing which could be inconvenient.

It states that some of the strongest prediction of diabetes T2DM is obesity and family history of diabetes [12]. In addition, genetics does play a role in the occurrence of T2DM but it is the poor lifestyle choices that contribute to the causes of diabetes that actually increases the susceptibility and severity of being diagnosed with T2DM [13]. So a poor/unhealthy diet does not only increase your chance of T2DM but an unhealthy/sedentary lifestyle too would highly likely contribute your chances [14].

To coincide the mentioned causes, the amount of preventions and interventions are very limited as they all target the same issues and that is to readjust patient's lifestyle, both with a more healthy diet and a proactive physical lifestyle [15]. As, from the intervention studies perspective, the main focus will lean more into the pharmaceutical aspects. There are certain medications used in prevention studies but the most common, boosting role in preventing at-risk individuals who are at the pre-stages of T2DM to be diagnosed [16]. The article also notes that being in these pre-stages could leave one at risk of other health related problems like hypertension and Polycystic ovary syndrome (PCOS) [17].

Moreover, the causes of T2DM occurs right across the globe and, despite the many existing known causes and even underlining problems, there still is much more to be discovered and further researched on its determinants and prevention. It was found that most of the articles were specifically describing how T2DM affects both genders especially those at their later years. Also, majority of the determinants are from poor lifestyle choices to looking after one's health and wellbeing.

The main objective of this systematic review is look into the determinants, prevalence, and preventions of T2DM in Arabic countries. Hence, this systematic review will provide a T2DM scope and trend to the determinants and prevention strategies identified from the various sourced articles from 2000 to 2015.

## Methodology

This systematic review was conducted based on the Cochrane library guideline and PRISMA criteria [18]. Through the duration of the systematic review the following databases and search engines were used: Scopus, Google scholar, CINAHL, Medline, and PubMed. Key-words like "Type 2 Diabetes Mellitus" AND "prevention" AND "prevalence" AND "determinants OR risk factor" AND "Arabic countries OR nations" were used to find relevant studies. We limited our search to be within the years 2000 to 2015, only English language papers and focused on Arabic countries. Those articles that were before and after the search years were considered as the exclusion criteria. Articles were published in Arabic language or we could not find their full texts were also excluded.

Two independent reviewers coded the article separately to

reduce the bias. Furthermore, we had three sets of review articles after omitting duplicated studies. The first step was scanning papers' titles. Then the search was focused on the abstract of remained studies. The last step was about reviewing the full text of remained studies. When the last search was conducted it brought our finding specifically to the article we needed.

The number of articles were found in each stage is shown in **Table 1**. In the systematic review out of 360 articles found only 22 articles were deemed to be relevant to the topic.

By reviewing the bibliography of remained paper, 3 new studies were added so that in total 25 were used for this systematic review study. The relevant information from the articles were obtained and included in the data extraction sheet (Annex) for further analysis. A descriptive analysis was used to calculate frequency, percentage of studies for different variables.

### Results

Overall 25 studies were reviewed in this study. Saudi Arabia with 5 studies had the highest frequency of studies which is followed by UAE (3 studies) and Qatar, Oman, and Kuwait (two studies each) (**Figure 1**).

**Table 2** illustrates that majority of studies were conducted among both male and female (8 studies). Five studies focused only on male and 2 studies were conducted among female only.

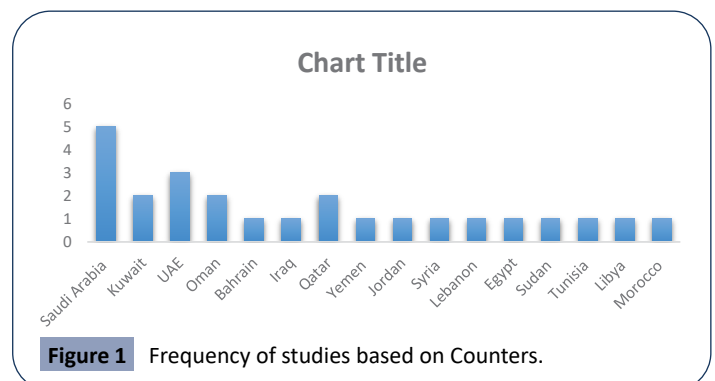
**Table 3** reveals that 52% of the studies focus in all age group, 12% focus on the age group of below 20, 32% focus on the age group of 20 – 50 and 4% among more than 50 years old.

**Table 4** gives an illustration from the studies been carried out, 24% of the studies was carried out in the Year 2000 – 2004; 56% was carried from the year 2005 to 2009 and 20% from 2010 to 2014.

**Table 5** shows the participants were well chosen in order to carry out the research. According to the result, 44% of studies focused

**Table 1** Frequency of studies were found in different steps.

DATABASES	STEP 1	STEP 2	STEP 3
Scopus	87	12	5
Google Scholar	122	22	8
PubMed	56	10	4
CINAHL	45	8	3
Medline	50	6	2
<b>TOTAL</b>	<b>360</b>	<b>58</b>	<b>22</b>



only on diabetic patients. 36% of the studies carried out focused on non-diabetic patient, 8% focused on high risk population. Similarly, 8% of the studies choose obesity people to be their participants. 4% of the studies focused on relative of diabetic patients.

As **Table 6** shows, 28% of the studies used experimental and clinical method, 8% used case control method, another 56% use observational/cross sectional method only, and 8% used prospective community based method of studies.

**Figure 2** demonstrates the different sampling methods. From the 25 studies reviewed, 53% use random sampling method, 41% use purposive and 6% use stratified method.

As **Table 7** shows, majority of countries had a prevalence of 10-20%. Qatar (50%) and Bahrain (30%) had the highest prevalence while Sudan had lowest rate (1.4%) which followed by Egypt (3.76%) and Morocco (6.4%).

**Figure 3** revealed the areas the studies were conducted. From the

**Table 2** Frequency of studies based on Gender.

Gender	Frequency	Percentage
Men only	5	20
Woman only	2	8
Both Men and Women	18	72

**Table 3** Frequency of studies based on Age.

Age	Frequency	Percentage
<20	3	12
20-50	8	32
50-over	1	4
All age groups	13	52

**Table 4** Frequency of studies based on the Year of study.

Year of study	Frequency	Percentage
2000-2004	6	24
2005-2009	14	56
2010-2014	5	20

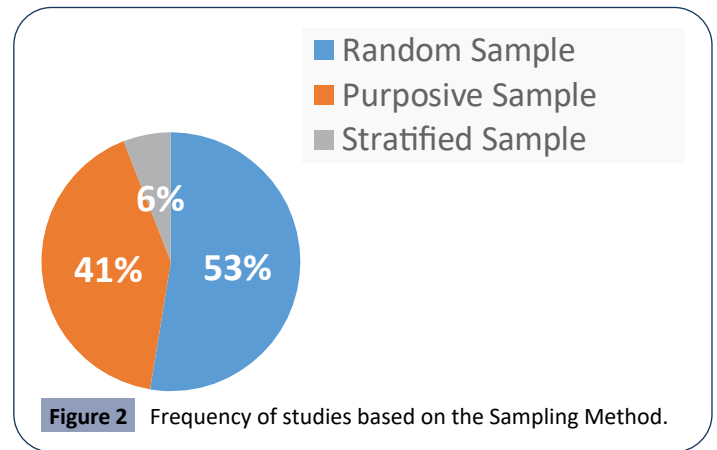
**Table 5** Frequency of studies based on Participants.

Participants	Frequency	Percentage
Relatives of diabetic patients	1	4
Diabetic patients	11	44
Non diabetic patients	9	36
High risk patients	2	8
Obesity	2	8

25 studies been carried out, 47% focused on determinant and risk factor, 23% focused on determinant with prevention, 24% focus on prevention only and the other 6% focused on the intervention.

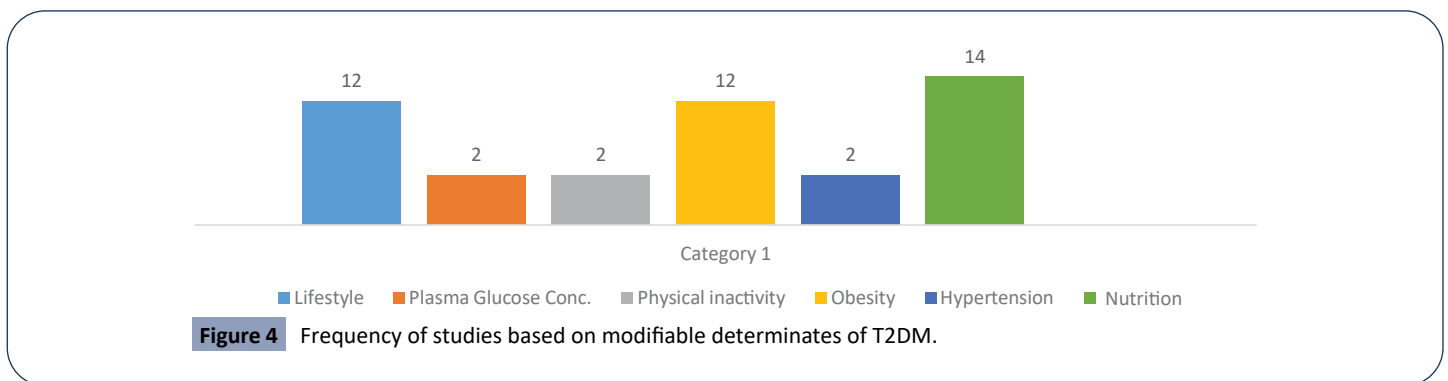
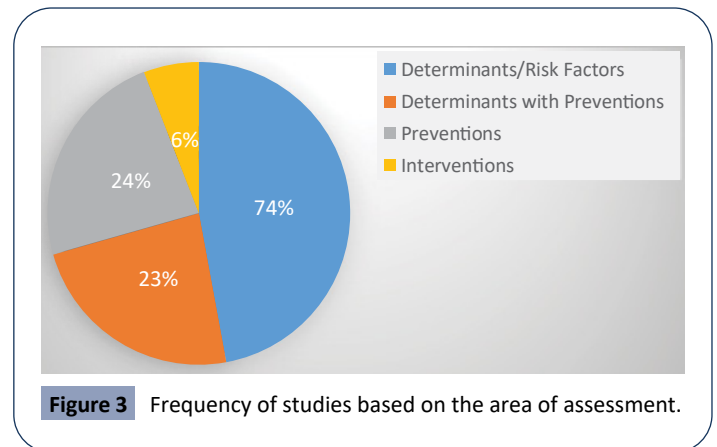
**Table 6** Frequency of studies based on Type.

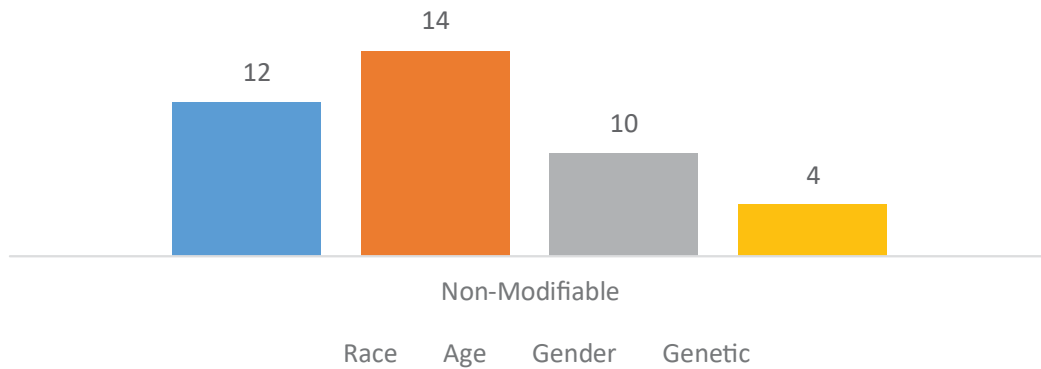
Study Type	Frequency	Percentage
Case Control	2	8
Clinical Studies	7	28
Observational/ Cross Sectional	14	56
Prospective Community Based	2	8



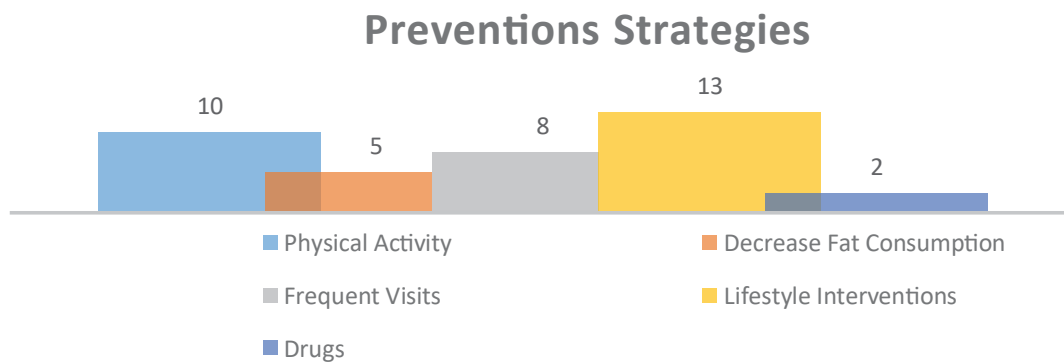
**Table 7** Frequency of studies based of Prevalence.

Prevalence	Number of studies
<10%	8
10-20%	11
20-30%	5
30>	1





**Figure 5** Frequency of studies based on non-modifiable determinates of T2DM.



**Figure 6** Frequency of studies based on Prevention Strategies.

Finding the determinants of diabetes was the one of the main aim in this review. The determinants were than classified as modifiable and non-modifiable parts. As **Figure 4** shows nutrition was the most common modifiable determinants (14 studies) which followed by lifestyle and obesity (12 studies each).

**Figure 5** illustrates the non-modifiable determinants which were of those cannot be changed. Age was the highest frequency of 14. The frequency at 12 which was the Race showed different cultures and way of life different races lived. Gender with 10 showed how the different sex respond to diabetes and lastly was 4 with genetic, which shared to off-springs with insulin productivity of various people determined through their genes.

**Figure 6** illustrated the prevention strategies were compiled from the different studies shown and listed to which of they occurred to be of effective. Lifestyle interventions were at a frequency of 13. Physical activities occurred 10, 8 was with frequent visits to health services and this leaves 5 due to the decreasing fat consumption and intake of drugs occurred only two.

## Discussion

T2DM is a well-known disease affecting many countries nowadays. From the many studies identified, 25 of the articles were selected and compiled to determine the main determinant, prevalence and prevention strategies for T2DM in Arabic countries.

As the results of this study showed Saudi Arabia had the highest

number of studies conducted on T2DM. It shows more attention needs to be considered by other countries to T2DM as one of the serious public health issues and do more study about it. The number of studies conducted in Arabic countries shows there could be lacking presence of valuable data about T2DM in many Arabic countries. Moreover, not everybody could excess the health services due to some social determinates faced, and thirdly, most cases would be either unaware of the importance of diabetes self-management behaviors or environmental, and systems barriers to diabetes self-management [19,20].

The results revealed that out of 25 studies, more than half of them were conducted in 2005-2009 while the number is reduced to 20% between 2010 - 2014. This shows, there were a lot of T2DM cases and researchers were working hard to find out the main determinants or causes of this disease as well as how to prevent them from happening. Majority of the studies were cross sectional studies (56%) it shows the need for doing other types of studies and especially interventional studies to measure eth effectiveness of different intervention in preventing T2DM. To find out the determinants and prevention for T2DM, researches chose their participants well. According to the study, 11/25 studies intentionally chose their participants to be diabetic patients while the other 9 focused on non-diabetic patient, obesity patients, and the rest among relatives of diabetic patients and high risk patients.

The prevalence of T2DM reported in this study shows, it is a main

health issue among Arabic countries. Since then researchers made T2DM as a leading issue when coming to research to find an intervention to the reduction in number of diabetes. It is recommended that primary health care initiatives such as awareness programs be improved upon as many of the articles written emphasized a lack in the effectiveness of primary health care which if given the proper attention can cut off the problem of T2DM from its roots [21,22].

According to the study, it has been found that there the majority of determinants for T2DM were classified into two types; the modified and non-modified determinants.

For the modified determinants, 14/25 of the studies show that nutrition is the main determinant of T2DM. What we eat define how we are and for this case more intake of sugar will lead to high glucose level and then insulin resistance in the body which then leads to T2DM. Nutrition itself leads to obesity which is one of the determinants of T2DM. According to the result, 12/25 studies agreed to that obesity and unhealthy lifestyle were the main determinants for T2DM. It is reported by previous research that around 90% of those who are living with T2DM are overweight or obese [21,23]. Hence, these at-risk people have additional pressure on their body's capacity to consume insulin to control blood sugar levels appropriately, and are in more chance to develop T2DM. Also to note about they have also made themselves susceptible to other medical complications [24].

Previous studies showed that lifestyle determinants have the greatest impact with regards to T2DM, followed by social status, environmental and poor policies and legislations. This shows that non modifiable risk factor are major contributing factor to T2DM [25,26].

Coinciding this to the non-modified determinant, 14/25 studies agreed that age is one of the main determinants of T2DM. The older people have more chance to practice sedentary lifestyle which leads to obesity and T2DM. Gender and genetics could also define the health of a person when comes to T2DM. Interesting finding by several studies showed that women with polycystic ovary syndrome (PCOS) are insulin resistant, so that they are high risk for glucose intolerance [27] that increase the factor of T2DM and would even underline other medical problems.

T2DM varies within different age groups; however, it can be similar within males and females [28]. According to the result 18/25 studies focused on both gender because they both have the same risk of getting this disease. There are many studies who agree on the above result. In a study carried out in Iran, female have high prevalence compare to male [29]. The similarity of the results is because women's spend more time at home and they are not physically active like women in Arabic countries [30]. This study shows that all age group are at risk and majority are from the age group of 20-50. The above mentioned age group is at risk due to them being exposed to change in lifestyle and as well as they are within an age group which is also known as working age group [31,32]. By looking at the results the main insight reveals that T2DM is very common among young adults or middle age group mainly living in urban areas. This shows that the lifestyle in the urban areas have been changing rapidly for most

due to people relying on fast foods and trapped in work offices resulting in inactivity. People tend to be careless about their health. Other contributing factors are diet, obesity, inactivity, hypertension, socioeconomic, age, gender etc. To support this idea from the result, a particular study which has been used in the review above states that obesity and diabetes in Arabic countries among males and females age 15 to 64 years revealed the key influence of diabetes in the Arabic countries was due to lifestyle, socioeconomic factors and weak legislations [33]. These factors can be improved with the help of health facilitators and engaging people in advocating healthy behaviors.

Amongst different studies which have been used in this study they state that the fast rating prevalence is the category of likeliness to prevail after 10-20 years with the highest percentage. This reflects that people whose age falls in this age group are in the active stage age 18 and above. On the other hand middle age group also have a high percentage with regards to the increasing rate of T2DM. The contributing factor that cause them to be victims are numerous such as child obesity, inappropriate feeding when they are little like, early introduction of fatty and junk foods leading to child overweight and obesity that might cause them to be inactive. This has made them to more susceptible and prone to becoming victims to T2DM [34].

Based on the results of this study the majority of the research articles contained advice or interventions relevant to the prevention of T2DM. The recommendations include increased physical activity, healthier diet and healthier lifestyle choices in preventing type diabetes [35].

Targeting specific lifestyle to prevent diabetes was of the most. Doing clinical and experimental studies will show causes and effects. Furthermore, complementing this is the discovery of having the highest majority of the studies to be regarding 'Determinants with Prevention' and 'Prevention which then leaves 'Intervention' topic of study to be the very least. A cleared logical explanation for this is because T2DM is a preventable disease compared to its type 1, also there had to be a majority of Clinical and Experimental studies in alignment these topics of study for the sole purpose of trial and error of discovering among test subjects which are the most suitable prevention strategies that would not just be the best alternative but the most effective out the other majority [36]. Our research findings projected preventions ideas where majority really focused on the changing ones unhealthy lifestyle to a more proactive one and minority of the study actually looked at the pharmaceutical aspects of preventing T2DM using effective preventative drugs like metformin, perindopril and indapamide [37,38] but then these drugs had even severe side-effects and require strict a lot of complicated follow-ups to accompany its most effective use.

Thus studies have shown that a healthy and proactive lifestyle prevents diabetes the most. This was more effective than those taking drugs, and frequent visits to the health services. Having healthy lifestyle which included the healthy diets, physical activity and preventing sedentary behaviors [39].

With the completion of this result there are some strengths and limitation which have been encountered along the way. This study

is the first study reviewed all the determinate, and preventive strategies were used for T2DM along with the prevalence of this issue in Arabic countries. The limitation was limited number of articles published about T2DM in Arabic nation as well as difficulty to achieve the full text of studies using different database to include in this review (Annexure [40-64]).

## Conclusion

In conclusion, it is obvious that the prevalence rate of T2DM has been very high amongst young adults and middle aged group, not forgetting the old people with the age of 50 years and above. This may be due to lifestyle, social status, environmental and policies and legislations. Other factors include diet, inactivity, obesity, hypertension, age and gender. Thus, it is clear that modifiable factors are responsible for the increasing rate of T2DM more than non-modifiable factors. On the same note, developing countries are more susceptible to T2DM than developed countries. Therefore, to reduce T2DM, it is very important at the regional, national, provincial and community level to work together to

established policies and ways to address the prevalence of diabetes as it is one of the most common NCD in the world today.

In this study it can be said that diabetes is a serious concern as it is increasing rapidly. Some of the identified risk factors that triggers diabetes are: cardiovascular disease, alcohol intake, and smoking. Similarly, people look at diabetes as inevitable which is a major drawback, thus, affecting them psychologically. However, diabetes is a lifestyle disease and most people are not aware of this, hence, vigorous awareness must be carried out in a way that people fully understand what diabetes is and how it can be prevented.

People have different lifestyles due to the condition they live in and the condition they have been through. To further elaborate, developing countries have the highest prevalence due to usage and availability of health care and health facilities installed for them. Some are more active to have a monthly medical checkup while some are very ignorant. Sometimes people think these small things have nothing to do with their health statuses but it does.

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