

## Prevalence and Associated Factors of Cigarette Smoking among Type 2 Diabetes Patients in Pakistan

Naila Khalid<sup>1</sup>\*, Ejaz Ahmad Khan<sup>2</sup>, Shifa Saleem<sup>1</sup>, Adeel Tahir<sup>3</sup>, Hassan Mahmood<sup>4</sup>, Sarah Saleem<sup>5</sup>

<sup>1</sup> Association for Social Development, Islamabad, Pakistan

<sup>2</sup> Health Services Academy, Islamabad, Pakistan

<sup>3</sup> National Tuberculosis Control, Islamabad, Pakistan

<sup>4</sup> Pakistan Medical Research Council, Islamabad, Pakistan

<sup>5</sup> Ministry of Health, Kingdom of Saudi Arabia

\* **Corresponding Author:** Naila Khalid

No. 79, Street 14, Falcon Complex, Lithrar Road, Rawalpindi, Pakistan

Mobile: + 92 322 4889622 | Email: nailaqa@gmail.com

---

### Abstract

**Background:** Pakistan ranks six in top ten countries with highest number of diabetics. Contributing factors are age, positive family history and obesity. Factors, such as smoking, increase the risk of cardiovascular events among diabetic patients. The study was planned to document the prevalence and associated factors of cigarette smoking among type-2 diabetes mellitus patients being seen at tertiary care hospitals in Rawalpindi Pakistan.

**Methodology:** A both qualitative and quantitative, cross sectional study was conducted, in order to determine the prevalence and associated factors of cigarette smoking among type 2 diabetics. Our study population was type 2 diabetic patients of 25 or more years of age. For qualitative part, we conducted two Focus Group Discussions (FGDs) with 6-8 participants, followed by semi-structured questionnaire as the qualitative part of the study.

**Results:** Prevalence of cigarette smoking among type 2 diabetes mellitus patients was 27%. There was significant association of male sex ( $p=0.00$ ), number cigarettes smoked in a day ( $p=0.000$ ,  $CI=1.92-2.135$ ), duration of disease ( $p=0.000$ ,  $CI=1.500-1.685$ ), duration of cigarette smoking ( $p=0.000$ ,  $CI=1.500-1.685$ ), and at least one episode of Cardio Vascular Disease (CVD) ( $p=0.026$ ). Smoking was initiated at early age and mainly influenced by peers and elderly in the family. Patients, who had diabetes for less than 20 years, were 1.41 times more likely to be smokers than the one who were diabetics for more than 20 years.

**Study Limitation:** The study has limitation of being a small cross-sectional study, the results of which cannot be generalized. However, it provides basis for larger studies on the subject in Pakistan.

---

**Conclusion:** The study concluded that smoking is prevalent among type 2 diabetic male patients and is associated with the initiation of smoking at younger age and the duration of the disease.

---

**Key words:** Diabetes mellitus, prevalence, smoking, risk factors

## **Introduction**

Diabetes mellitus is a group of metabolic diseases in which, an individual has high blood sugar which could be due to the fact that pancreas is unable to produce insulin or because cells do not utilize the insulin been produced.<sup>1</sup> Type-2 diabetes formerly called non-insulin-dependent or adult-onset diabetes is caused by the body's ineffective use of insulin. It often results from excess body weight and physical inactivity.<sup>2</sup> A total of 366 million people around the world had Diabetes Mellitus in the year 2011 and, it has been estimated that by the year 2030 the world will have 552 million type-2 diabetics.<sup>3</sup> Most (80%) of these diabetics belong to Low and Middle Income Countries (LMICs) having between 40 to 59 years of age.<sup>3</sup>

Diabetes caused 4.6 million deaths in 2011.<sup>3-4</sup> Based on prevalence of diabetes, the International Diabetes Federation (IDF) has divided world into different regions. One-fifth of all adults with diabetes in the world live in South-east Asia region most of whom are from India. About 61.3 million diabetic patients in 2011 reside in India.<sup>5</sup> Six out of ten countries with highest prevalence of diabetes belong to Middle East and North African region Pakistan being one of them.<sup>5</sup> In the Middle East and North African region about 32.8 million people or 9.1% of the adult population has diabetes mellitus.<sup>5</sup> As a part of this region Pakistan ranks sixth among the global top ten countries with highest number of people with diabetes.<sup>6</sup>

According to National Diabetes Survey of Pakistan (NDSP-1990) the prevalence of type-2 diabetes above the age of 25 year is 11%.<sup>7</sup> Prevalence of diabetes mellitus and Impaired glucose tolerance is 22.04% in urban and 17.5% in rural communities in Pakistan.<sup>8-9</sup> High prevalence of Type-2 diabetes mellitus in developing countries poses significant challenges to health systems. Diabetes mellitus is a costly disease, due to its chronicity and multi-organ involvement. Sufficient data related to economic burden of diabetes is available from developed countries, on contrary there is no or limited data is present from developing countries and there is no standardize guideline to be observed in conducting cost estimation.<sup>10</sup> India, China and Indonesia have the highest number of people with diabetes mellitus in Asia region.<sup>10</sup> The total number of cases in these three countries is expected to increase more than double from 61 million in 2000 to 163 million in 2030.<sup>9</sup> By the year 2015 deaths due to diabetes will rise 51% in Pakistan.<sup>11</sup> China and India will suffer cumulative Gross Domestic Product (GDP) loss of 13.8% and 16.7% respectively, over the next ten year period.<sup>10</sup> It is expected that Pakistan will lose 31 billion dollars by year 2015 from premature deaths due to stroke, heart diseases and diabetes.<sup>11</sup> In Iran healthcare system consumes more than 8.69% of total health expenditure. The total national cost of Iran for diagnosed Type-2 diabetes mellitus in 2009 is estimated at 3.78 billion USA dollars.<sup>12</sup>

---

Major factors associated with diabetes are age, positive family history, and obesity.<sup>8</sup> Another factor which increases the risk of Cardiovascular diseases among type-2 diabetic patients is smoking. There is a strong evidence of positive relationship between cigarette smoking and diabetes mellitus.<sup>13</sup> There is a positive association of dose-dependent cigarette smoking and diabetes mellitus.<sup>14</sup> Active as well as passive smoking increases the risk to developing type-2 diabetes mellitus.<sup>15</sup> Tobacco use is further associated with increase of mortality and morbidity in diabetic patients due to poor metabolic control.<sup>16</sup> One of the study in Pakistan reveals that about 40% of diabetic patients are exposed to passive smoking and about 13% are active smokers.<sup>17</sup>

## **Literature Review**

According to International Diabetes Federation (IDF), about 80% of four million diabetes related deaths that occur every year take place in the developing world.<sup>18</sup> Due to resource constraints, the IDF has suggested to focus more on prevention of diabetes complications in Low and Middle Income Countries (LMICs).<sup>18</sup> Development of educational intervention programs intended to compact high numbers of diabetes complications will be an appropriate strategy.<sup>18</sup> Reduction in diabetes related deaths in developing countries can be achieved by intensified diabetes self-management education.<sup>19</sup>

Large prospective cohort study was conducted by American Cancer Society (ACS) as Cancer Prevention Study 1 from 1959 to 1972, data was used to determine the association of cigarette smoking and diabetes mellitus. The results showed positive dose-related relationship between cigarette smoking and diabetes mellitus.<sup>14</sup> Another 7 year old cohort study was conducted to prove the association of passive and active smoking in development of type-2 diabetes mellitus in the elderly population in Germany. Study excluded already diagnosed with type-2 diabetes mellitus patients. Study revealed that both passive and active smoking increase the risk of type-2 diabetes mellitus.<sup>15</sup>

National Diabetes Survey of Pakistan (NDSP-1990) reported a very high unawareness rate for diabetes, with 36.3% of the people with diabetes being unaware of their condition. Survey has revealed that knowledge relating to diabetes and its prevention is significantly low even in the urban metropolitan areas: only 40% of the people known to have diabetes treated at tertiary health care facilities in Karachi had correct knowledge relating to diabetes and its complications.<sup>7</sup> Data was gathered retrospectively from 210 patients with type-2 diabetes visiting outpatient department of a tertiary care hospital in Karachi Pakistan. Results of the study revealed that most significant predictors for metabolic syndrome were female gender, low HDL cholesterol levels and high systolic blood pressure. Study suggested early initiation of primary prevention strategies to cope with alarming high frequency of metabolic syndrome.<sup>20</sup> Diabetic patients are at an increased risk of developing cardiovascular diseases but there exists lack of awareness regarding the tobacco use, diabetes and its complications.

A study was done to evaluate the CVD-related lifestyle factors among type-2 diabetes patients in outpatient clinics in Karachi, Pakistan. Results of the study showed that majority of the patients

are physically inactive and have adverse psychosocial factors. About 40% are exposed to passive smoking and 13% are active smokers.<sup>17</sup>

Descriptive cross-sectional study was conducted from March 2008 to June 2008 at Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and metabolic disorders (BIRDEM) Hospital, Shahbagh Dhaka to find out the pattern of tobacco consumption among diabetic patients.<sup>21</sup> The study suggested that tobacco consumers are mostly in 40 and 50 years age group and belonged to lower-middle class socio-economic status.

Prevalence of tobacco use among diabetic patients in Pakistan was studied by Sheikh et al in Civil hospital Karachi (2001).<sup>22</sup> The study showed tobacco use is more common in male diabetics (68.1%) as compared to females (31.9%). In Pakistan smoking is more common in males, belonging to low income and low education level groups.<sup>23-24</sup> Dose-dependent association between cigarette smoking and diabetes also provides evidence that removal of the exposure diminishes the risk of developing diabetes.<sup>13</sup>

A systemic review with meta-analysis<sup>25</sup> was done to assess the association between active smoking and incidence of type 2 diabetes. MEDLINE and EMBASE databases were searched. Studies which reported risk of impaired fasting glucose, impaired glucose tolerance, or type-2 diabetes in relation to smoking status were included in the analysis. Study revealed that since prevalence of diabetes is expected to increase drastically by the year 2025, it imposes a significant public health burden and large demands on health care systems. Study suggested that active smoking is independently associated with glucose intolerance, impaired fasting glucose, and type-2 diabetes therefore smoking is a modifiable risk factor for type-2 diabetes.

A study conducted in China to understand the contribution of modifiable lifestyle factors on developing type-2 diabetes.<sup>26</sup> Association between life style factors including physical activity, smoking and alcohol consumption with incidence of type-2 diabetes mellitus among middle aged and elderly men in China was explored in the study. Information was collected through in-person interviews. Anthropometric measurements were also recorded. All respondents were free of type-2 diabetes and coronary heart disease at the baseline. Incident of type-2 diabetes was identified through follow-up surveys conducted every 2-3 years. Results of the study revealed that smoking was associated with increase type 2 diabetes mellitus risk for persons smoking more than 20 cigarettes per day.

A study by Meisinger C. et al.<sup>27</sup> was done to examine the sex-specific association between cardiovascular risk factors, a parental history of diabetes and type-2 diabetes mellitus. MONICA (Monitoring of Trends and Determinants in Cardiovascular Disease) Augsburg surveys were conducted to during 1984-1995, participant included 3052 men and 3114 women who were free of type-2 diabetes at baseline. Results revealed that a total of 128 cases of incident type-2 diabetes mellitus among men and 85 cases among women were registered during the follow-up period. Systolic blood pressure, regular smoking and high daily alcohol intake predicted the development of type-2 diabetes mellitus in men only.

A population-based cross sectional study<sup>28</sup> was done on selected French population to examine whether an independent relationship between cigarette smoking and type-2 diabetes exists in

---

both men and women and to assess the effects of active smoking and smoking cessation on the prevalence of diabetes. The results of the study showed that the risk of diabetes mellitus was higher in current and former smoker men as compared to non-smokers men.

A clinic based study by Al-Mukhtar SB<sup>29</sup> was conducted in Iraq to report the characteristics of cardiovascular risk factor relevant to age (more and less than 60) and gender. The study recruited 462 randomly selected type-2 diabetics. The analysis was done according to age, duration of diabetes, smoking, socioeconomic status, anthropometric indices, blood pressure, fasting plasma glucose, glycated hemoglobin A1c and serum lipids. The results of the study revealed that all these factors are significantly higher among younger type-2 diabetes mellitus patients.

A study carried out by Ahmed R. et al.<sup>30</sup> about the prevalence of cigarette smoking among university students in Karachi, Pakistan. Study recruited 629 (432 males and 197 females) university student aged 18-25 years. The results showed that about 39% of students smoked a whole cigarette in their life time, whereas 25% had smoked 100 or more cigarettes in their lifetime. Overall 23% of students were classified as a current smokers and their mean age at smoking initiation was 17 years for males and 16 years for females. Study suggested that parental and sibling influence and individuals who smoke at home were highly predictive of being a smoker.

## **Rational**

Diabetes is associated with several risk factors; cigarette smoking is one of them. Several prospective studies have showed that cigarette smoking is an independent and modifiable risk factor for diabetes.<sup>31</sup> Cigarette smoking increases the risk of coronary heart disease, stroke and peripheral vascular disease in type 2 diabetes patients.<sup>32</sup> Prevalence of tobacco consumers are mostly from productive age group of diabetic patients and belong to lower middle class of socioeconomic background.<sup>21</sup> Pakistan has a high prevalence of both type-2 diabetes and cigarette smoking (21.6% According to National Health Survey) yet limited research has been done on cigarette smoking among diabetes patients. Therefore study was planned to document the prevalence and pattern of cigarette smoking among type-2 diabetes mellitus patients in a clinic-based population.

## **Methods**

### ***Research Project***

We conducted this mixed-methods cross sectional study, comprising of both qualitative and quantitative aspects, at the three tertiary care hospitals in Rawalpindi, Pakistan. ***Qualitative part*** was conducted first to evaluate the associated factors of cigarette smoking among the type 2 diabetes patients and construct themes to facilitate us in developing quantitative questionnaire. It comprised of two Focus Group Discussions (FGDs) of 6-8 homogenous group of participants.

Participants were type-2 diabetic patients who were current or ex-smokers. FGDs took place in District Head Quarter Hospital Rawalpindi. FGD guide was developed and administered to determine the association of cigarette smoking and type-2 diabetes mellitus. Our variables of interest were: when and how was cigarette smoking initiated, knowledge about hazards of cigarette smoking, average number of cigarettes smoked in a day, whether received any smoking cessation message, and when complications developed?

*We conducted the Quantitative* part at Benazir Bhutto and Holy Family Hospitals in Rawalpindi Pakistan. Structured questionnaire was administered to each patient and responses were recorded. Quantitative part of the study aimed to explain the variables such as duration of the disease, duration of cigarette smoking, average number of cigarettes smoked in a day, family history of Cardio Vascular Diseases (CVD) and hypertension, and whether the respondent has ever experienced a CVD event (Myocardial Infarction, Heart Attack) in his life time.

Subjects were type-2 diabetic patients (male and female) of 25 or more years of age visiting diabetic clinics of tertiary care hospitals. We did convenient sampling.

**Sample size and statistical analysis:** Based on the prevalence of cigarette smoking among type 2 diabetic patients (13%), with the level of significance of 5% and sampling error of 10%, the sample size was calculated at 180 which was then increased by 5% to cover refusals. The final sample size was thus, 189 subjects.

For the statistical analysis, SPSS software program version 20 was used. All the collected data were entered, tabulated, organized and then coded. Descriptive analysis was carried out to explain the demographic characteristics and prevalence of smoking among type 2 diabetics. The statistic and Chi square tests were used for quantitative and qualitative variables respectively, to prove their significance.

For the qualitative part of the study collected data were first coded and then transcribed according to themes. Study was analyzed through content analysis.

### ***Ethical Consideration***

The study was approved by internal review board, Health Services Academy Islamabad. It was endorsed by Health Department of Punjab, Pakistan. Informed consent was obtained by the patients, who qualified for the study. They were informed about the nature and purpose of the study. Participation was purely voluntary with the right to withdraw any time during the study. No benefit or risk was involved in this study and monetary compensation was not provided in this study. The information provided by the participant remained confidential and their identity has not been disclosed. No one, except the principal investigator, had access to the acquired information. However, the data might be seen by ethical review committee and be published in the journal and elsewhere without giving the participant name and disclosing their identity.

## Results

### *Qualitative*

We held two FGDs in the District Headquarter Hospital Rawalpindi. Each FGD session was conducted with six to eight participants homogenous for both the males and females. However, males predominated in overall representation. We carefully kept those participants separate for the quantitative part of the study to avoid any potential contamination.

Most of the participants were smokers for more than 10 years. One of the respondents, who happened to be a laborer, stated *"I have been smoking for the last 45 years"*. Another respondent who was a shopkeeper said *"I started smoking when I was just 15 or 16 years old"*. One respondent smoked for 25 years but then one day heard a message on radio about hazards of smoking which helped him in quitting. Most of participants started smoking at an early age of 14-18 years.

Mostly they started smoking when they had a company of smokers. One respondent said he started smoking when he saw his elders smoking and explained *"I started it for just fun. But later it became my habit"*. One of the respondent who was a shopkeeper started smoking by watching and selling cigarettes to his customers.

*"I usually smoke 20 cigarettes a day"*, said one of the respondents. While another respondent reported that *"I only smoke two to three cigarettes a day"*. They all smoked regularly and in varying quantities. Nonetheless, they all agreed that it is bad for health, and damages lungs. One respondent narrates as *"it's a bad addiction"*. There were two cases, which however, quitted smoking after 10 years or more.

Almost all of the participants narrated that they knew that cigarette smoking is injurious to health. They all had at least one source for this information. A respondent said *"my doctor told me to stop smoking"*. One of the respondent said *"my wife asked me to quit smoking since it was unhealthy"*. One respondent informed *"I watched on the TV that it was not good for health"*. One respondent explained that *"my hakeem (traditional doctor) told me that smoking was dangerous for health"*.

Participants were asked if they had diabetes before or after they started smoking. *"I got this disease due to family tension and problems. It is a family disease"*, said by one of the respondents. One person said that he got diabetes due to the fact he was non-active physically and another respondent was of the view that he got diabetes due to smoking alone. A respondent, who had business of catering, narrated that *"I sit and think a lot so I developed diabetes"*. A respondent, who was a laborer, said that *"I got diabetes due to cigarette smoking"*.

One respondent remembered *"I developed diabetes about 12 years ago"*, and another recalled developing diabetes about 10 months ago. One of the respondent exclaimed that *"I had diabetes for 16 years and I developed it in 1997"*.

Hypertension was found to be the most commonly found co-existing condition among majority of the participants. One of the respondents had hypertension for the past 6-7 years, he narrated “*I have hypertension and cardiac problem for the last 8 years, and also had By Pass heart surgery*”. “*I have high blood pressure and seven years ago had paralysis*”, narrated by one of the respondent. One respondent had hypertension for the last six years and once had heart attack; another respondent was suffering from tuberculosis and type-2 diabetes mellitus.

### ***Quantitative***

We calculated prevalence of smoking among diabetics at 27%. Most (65.3%) of the respondents were males. Altogether, the age for all the respondents ranged between 25-65 years. Being mostly (one fourth) educated to fifth grade, they were primarily employed either in the private sector or were having businesses of their own. Nearly half (48.2%) had an income of more than 20,000 rupees per month (US\$ 200/month). About one-fourth (27.1%), of the respondents smoked cigarettes and, half of those (15.1%) smoked around 10-20 cigarettes in a day. Among those who smoked, about less than one-fourth (17.1%) had been smokers for 20 years or more. Mostly (64.8%), the respondents were having type-2 diabetes for less than 20 years and nearly one-fourth (27.6%) of those also had family a history of type-2 diabetes mellitus. Just above one-third (37.4%) of the diabetics, also reported having hypertension (Table 1).

We used unpaired t-test for continuous variables to understand difference in association of factors between both the smokers and non-smokers among the diabetics: Type-2 diabetic patients of age between 25-65 years ( $p=0.043$ ,  $CI=0.081-0.67$ ) were more likely to smoke cigarettes than patients of age more than 65 years. Smokers were more likely to smoke 10-20 cigarettes a day ( $p=0.000$ ,  $CI=1.92-2.135$ ). Patients having type 2 diabetes mellitus for less than 20 years were found to be the potential smokers ( $p=0.000$ ,  $CI= 1.500-1.685$ ) than those having diabetes of 20 or more years.. Type 2 diabetic patients, who were smokers, were found smoking cigarettes for a duration of 20 years or more ( $p= 0.000$ ,  $CI=1.500-1.685$ ) (Table 2).

Pearson Chi square test was applied to the categorical variables to find the level of association among these variables (factors). All the potential smokers were primarily males ( $p=0.00$ ). Type 2 diabetic smokers were more likely to experience a CVD event ( $p= 0.026$ ) than the non-smokers. No association was found between presence of hypertension, family history of CVD, and family history of diabetes mellitus when cross-tabbed with smoking. Similarly, education did not have much role in being smokers ( $p=0.075$ ). But smoking did have strong association with the occupation of private jobs or being business man ( $p= 0.00$ ) (Table 3).

### **Discussion**

The study revealed prevalence of cigarette smoking among type-2 diabetic patients as 27%, which is slightly lower when compared to the figures reported for the males in general population (34.47%) in Pakistan (World Bank 2009).<sup>33</sup> Another study by Ahmed R. et al (2008)<sup>30</sup>

---

done on university students in Karachi Pakistan, showed that 39% of respondents had smoked a whole cigarette in their life time, and about 25% had smoked 100 or more cigarettes in their life time. Patient's sex and profession has some association with this phenomenon, where type-2 male diabetics are prone to be smokers. Professionally, those smokers were either having private sector jobs or doing some business. Experiencing an episode of CVD was common among those type-2 diabetic smokers.

The risk of diabetes is greater for heavy smokers than for lighter smokers and lower for former smokers.<sup>25</sup> Compared with non-smokers current male smokers who smoke more than 20 cigarettes per day have increased risk of diabetes.<sup>34</sup> Cigarette smoking increases the risk of developing type 2 diabetes mellitus, when considered among other factors such as obesity and physical inactivity. A study by Ito et al.<sup>35</sup> showed prevalence of current smoking among type-2 diabetic patients being 35%. Another study revealed that approximately 20% of adults aged 18 years or older with type-2 diabetes were current smokers.<sup>36</sup> The results are not much different from the results of these studies, but done in Pakistani population. Cigarette smoking is documented to be associated with increase in the risk of having type-2 diabetes mellitus among who consumes more than 20 cigarettes in a day.<sup>31</sup> The risk of developing diabetes increases many folds by cigarette smoking, and it aggravates the micro and macro-vascular complications.<sup>37</sup> Active smoking is associated with an increased risk of type 2 diabetes.<sup>27</sup> Another study by Jee et al.<sup>34</sup> showed significant associations of smoking with increased risk of type 2 diabetes mellitus, and mortality among both male and female smokers. Current smokers, who are male, have a higher incidence of developing type 2 diabetes mellitus. This risk of developing diabetes mellitus is higher in current and former smoker men and it is even higher in men aged 40-69.<sup>28</sup> Systolic blood pressure, regular smoking, and high alcohol intake leads to the development of diabetes mellitus in men.<sup>27</sup> These results conform with the findings of the present study. A study by Roselli d R G. et al.<sup>38</sup> showed that current smoking, age, high fasting plasma glucose levels are associated with cardiovascular mortality. On contrary a study by Al Suwaidi.etal<sup>39</sup> showed that mortality rate and cardiovascular events are lower in current tobacco users when compared with the non-tobacco users and ex-tobacco users.

Duration of the disease was one of the factors found to be significant in my study. Patients having type-2 diabetes mellitus for less than 20 years were more likely to be smokers than those having diabetes mellitus of 20 or more years. Another significant result of the study was that the smokers consume about 10-20 cigarettes in a day. Duration of cigarette smoking was significantly related to the development of type-2 diabetes mellitus, as most of the smokers in this study had been smoking for more than 20 years. The study also proved that among cigarette smokers, initiation of smoking was at younger age and it was introduced by peers and elders in family. A study by Kukkamalla MA. et al.<sup>40</sup> presented that cigarette smokers more likely belong to younger age group and their habit is mainly for pleasure and relaxation, peer pressure is the main reason for initiation of cigarette smoking.

This study has limitations as being a small clinic base study, the results of which cannot be generalized, but it strongly identifies prevalence and associated factors of smoking and diabetes mellitus. This provides good opportunity to do further research on the topic and develop policy focusing smoking cessation as a vital part in the management of type 2 diabetes mellitus.

This study sets the base line for future large-scale studies on diabetes and smoking in Pakistan. However, these preliminary results do implicate health education activities for diabetics to restrain from smoking and initiate smoking cessation programs for this target population.

## **Conclusion**

Study concludes that smoking is prevalent among type 2 diabetic male patients in Rawalpindi, Pakistan. Most of the patients start smoking at younger age, influenced by family and friends. Among significant factors sex, profession, duration of disease, duration of cigarette smoking, and number of cigarettes consumed in one day, have strong association with development of the disease. Study reported Cardio Vascular complication as an adverse consequence of smoking among type-2 diabetic patients. The patients having lesser years of diabetes were more prone to the smoking than the ones with longer disease duration.

**Conflict of Interest:** The authors declare that there is no conflict of interests regarding the publication of this article.

---

## **References**

1. About Diabetes. International Diabetes Federation Web site. [www.idf.org/about-diabetes](http://www.idf.org/about-diabetes) Published 2013. Accessed June 25, 2013
  2. Diabetes. World Health Organization Web site. [www.who.int/topic/diabetes-mellitus/en](http://www.who.int/topic/diabetes-mellitus/en) Published 2012. Accessed September 10, 2012
  3. Non-communicable disease. World Health Organization Web site. [www.who.int/mediacentre/factsheet/fs355/en/index.html](http://www.who.int/mediacentre/factsheet/fs355/en/index.html) Published September 2011. Accessed September 10, 2012
  4. The Diabetes Atlas. International Diabetes Federation Web site. [www.idf.org/diabetesatlas/5e/the-global-burden](http://www.idf.org/diabetesatlas/5e/the-global-burden) Published 2011. Accessed September 10, 2012
  5. The Regional Overview. International Diabetes Federation Web site. [www.idf.org/diabetesatlas/5e/the-regional-overview](http://www.idf.org/diabetesatlas/5e/the-regional-overview) Published 2011. Accessed September 10, 2012
  6. Diabetic epidemic out of control. International Diabetes Federation Web site. <http://www.idf.org/diabetes-epidemic-out-control>. Published 2006. Accessed September 10, 2012
-

7. Nishtar S, Shera S. Diabetes prevention and control as a part of an integrated non-communicable disease strategy: the Pakistan approach. *PractDiabInt*. Oct 2006;23(8)
8. Mirza S. Non-communicable disease burden in Pakistan. Public Health Solutions Pakistan Web site. [www.pjsp.com.pk/non-communicable-disease-burden-in-pakistan](http://www.pjsp.com.pk/non-communicable-disease-burden-in-pakistan) Published July 2011. Accessed September 10, 2012
9. Shera AS, Jawad F, Maqsood A. Prevalence of diabetes in Pakistan. *Diabetes Res ClinPract*. May 2007;76(2):219-222
10. Ibrahim WN, Aljunid S, Ismail A. Cost of Type 2 diabetes mellitus in selected developing countries. *MJPHM*. 2010;10(2):68-71
11. WHO Chronic Diseases and Health Promotion data base, the impact of chronic disease in Pakistan Web site. <http://www.who.int/chp/chronic-disease-report/en/> Accessed June 20, 2013.
12. Mail MJ, BaradaranHR, Mashayekhi A, et al. Cost-of-illness analysis of Type 2 diabetes mellitus in Iran. *Pharmacoeconomics*. 2003;21(8):543-64
13. Willi C, BodenmannP, Ghali WA, FarisPD, Gornez J. Active smoking and the risk of type 2 diabetes: A systematic review and meta-analysis. *JAMA*. 2007;298(22):2654-2664
14. Will C J, Galska A D, Ford SE, Mokdad A, Calle E E.. Cigarette smoking and diabetes mellitus: evidence of a positive association from a large prospective study. *Int J Epidemiol*. 2001;30:540-546
15. Kowall B, Rathmann W, Strassburger K, et al. Association of passive and active smoking with incident type 2 diabetes mellitus in the elderly population: the KORAS4/F4 cohort study. *EurJEpidemiol*. 2010; DOI 10.1007/s10654-010-9452-6
16. Shaikh A N, Bhatti S, Baloch A A, Vaswani S A, Sumbhuani K A, Fatima A S S. Prevalence and Pattern of Tobacco use in diabetic patients at Civil Hospital Karachi. *Pakistan Journal of Chest Medicine* Web site. [pjcm.net/html-v14-n4-ab3.php](http://pjcm.net/html-v14-n4-ab3.php). Published 2010. Accessed June 20, 2013
17. Khuwaja AK, Lalani S, Azam IS, Ali BS, Jabbar A, Dhanani R. (2011). Cardiovascular Disease-Related lifestyle factors among people with type 2 diabetes in Pakistan: A multicenter study for the prevalence, clustering, and associated sociodemographic determinants. *Cardiol Res Pract*. 2011;2011:656835. doi:4061/2011/656835.

18. Nishtar S, Shera S. Diabetes prevention and control as part of the integrated Non-communicable Disease strategy: the Pakistan approach. *Practical Diabetes Int.* 2006;23(8):332-334
19. Ezenwake C, Eckel J. Prevention of diabetes complications in developing countries: time to intensify self-management education. *Arch Physiol Biochem.* 2011; 117(5):251-3
20. Ahmed A, Khan TE, Yasmeen T, Awan S, Islam N. Metabolic syndrome in type 2 diabetes: Comparison of WHO modified ATPIII&IDF Criteria. *J Pak Med Assoc.* 2012;62(6):569-74
21. Biswas MK, Biswas AK, Biswas G, Begum J. (2011). Pattern of tobacco consumption among the diabetic patients. *Faridpur Med Coll J.* 2011;6(2):95-99
22. Jabbar A, Contractor Z, Ebrahim MA, et al. Standard of knowledge about their disease among patients with diabetes in Karachi, Pakistan. *J Pak Med Assoc.* 2001;51(6):216–218.
23. Merchant AT, Luby SP, Perveen G. Smoking among males in a low socioeconomic area of Karachi. *JPMA.* 1998; 48:62-63
24. Nisar N, Qadri MH, Fatima K, Perveen S. A community based study about knowledge and practices regarding tobacco consumption and passive smoking in Gadap Town, Karachi. *JPMA.* 2007; 57:186-188
25. Willi C, Bodenmann P, Ghali W, Faris D, Comuz J. Active smoking and the risk of type 2 diabetes A systematic review and meta-analysis. *JAMA.* 2007;298(22):2659-2664
26. Shi L, Shu XO, Li H, Cai H, Liv Q et al. Physical activity, smoking, and alcohol consumption in association with incidence of type 2 diabetes among middle-aged and elderly Chinese men. *PLoS One* 2013; 8(11):e7791 doi:10.1371/journal.pone.0077919
27. Meisinger C, Thorand B, Schneider A, Stieber J, Doring A, Lowel H. Sex differences in risk factors for incident type 2 diabetes mellitus The MONICA Augsburg Cohort Study. *Arch Intern Med.* 2002;162(1):82-89
28. Beziaud F, Halimi JM, Lecomte P, Vol S, Tichet J. Cigarette smoking and diabetes mellitus. *Diabetes Metab.* 2004;30(2):161-6
29. Al-Mukhtas SB, Fadhil NN, Hanna BE. General and gender characteristics of type 2 diabetes mellitus among the younger and older age groups. *Oman Med J.* 2012 Sep;22(5):375-82

30. Ahmed R, Rizwan-ur-Rashid, McDonald PW, Ahmed SW. Prevalence of cigarette smoking among young adult in Pakistan. *J Pak Med Assoc.* 2008;58(11):597-601
31. Thresia U C, Thankappan R K, Nichter M. Smoking cessation and diabetes control in Kerala, India: an urgent need for health education. *Health EducRes.* 2009;24(5):839-845
32. Eliasson B. Cigarette smoking and diabetes. *ProgCardiovascDis.* 2003;45:405-13
33. World Bank Evaluations. Trading economics Web site.<http://www.tradingeconomics.com/pakistan/smoking-prevalence-males-percent-of-adults-wb-data.html>. Published 2013. Accessed February 04, 2014
34. JeeSH, Foong AW, Hur NW, Samet JM. Smoking and risk for diabetes incidence and mortality in Korean men and women. *Diabetes Care.* 2010;33(12): 2567-72
35. Ito H, Antoku S, et al. The prevalence of the risk factors for atherosclerosis among type 2 diabetic patients is greater in the progressive stages of chronic kidney disease. *Nephron Extra.* 2013;3(1):66-72
36. GhitzaUE, Wu LT, Tai B. Integrating substance abuse care with community diabetes care: implications for research and clinical practice. *Subst Abuse Rehabi.* 2013;4:3-10
37. Sang AH C. Smoking and type 2 diabetes mellitus. *Diabetes MetabJ.* 2012;36(6):399-403
38. Roselli d. r. G, Lapolla A, Sartare G, Rossetti C, Zambon S, Minicuci N. Plasma lipoproteins, apoproteins and cardiovascular disease in type 2 diabetes patients. A nine-year follow-up study. *NutrmetabCardiovascDis.* 2003;13(1):46-51
39. Al Suwaidi J, Al Habib K, Singh R, et. al. Tobacco modalities used and outcome in patients with acute coronary syndrome: an observational report.*postgradmedj* 2012; 88(1044):566-74. doi: 10.1136/j.130178Eupb 2012 May 31
40. Kukkamalla MA, Pentapati KC, Suresh G, Goyal R, Cornelio SM. (2013). Smoking re-initiation after cessation program: Comparison of associated factors between younger and older adult.*J NalSciBiol Med.* 2013; 4(2):440-4 doi:10.4103/0976-9668.117015

**Table 1:** Socio-demographic characteristics of the study population

<b>Variable</b>	<b>Number (n)</b>	<b>Percentage (%)</b>
<b>Age (years)</b>		
25-65	161	80.9
> 65	38	19.1
<b>Sex</b>		
Male	130	65.3
Female	69	34.7
<b>Education</b>		
Illiterate	20	10.1
Primary	50	25.1
Middle	47	23.6
Secondary	49	24.6
Higher	33	16.6
<b>Profession</b>		
Housewife	58	29.1
Government	34	17.1
Private	73	36.7
Unemployed	22	11.1
Others	12	6.0
<b>Income (PKR)</b>		
< 10,000	46	23.1
10,000-20,000	57	28.6
>20,000	96	48.2
<b>Smoking status</b>		
Yes	54	27.1
No	145	72.9
<b>Number of cigarettes smoked in one day</b>		
None (0)	143	73.4
<10	10	5.0
10-20	30	15.1
>20	13	6.5
<b>Duration of cigarette smoking (years)</b>		
0	147	73.9
<20	18	9.0
20 years and more	34	17.1
<b>Duration of diabetes mellitus (years)</b>		

Variable	Number (n)	Percentage (%)
<20	129	64.8
20 years and more	70	35.2
<b>Family history of diabetes mellitus</b>		
Yes	55	27.6
No	65	32.7
Don't know	79	39.7
<b>Presence of hypertension</b>		
Yes	74	37.4
No	122	61.3
Don't know	3	1.5
<b>Experience of any CVD event</b>		
Yes	6	3.0
No	138	69.3
Don't know	55	27.6
<b>Family history of CVD</b>		
Yes	6	3.0
No	50	25.1
Don't know	143	71.9

**Table 2:** Continuous variables (using T Test)

Characteristics (mean)	Cigarette smokers	Ex/Non cigarette smokers	T statistic	P value	95% CI
Age • In years	54	145	0.682	.043	0.081-0.167
Duration of type 2 diabetes mellitus • In years	54	145	33.970	0.000	1.500-1.685
Numbers of cigarette consumed in one day	54	145	34.213	0.000	1.92-2.135
Duration of cigarette smoking in years	54	145	33.970	0.000	1.500-1.685

**Table 3:** Categorical variables (using Pearson Chi Square)

Variable	Cigarette smokers	Ex/Non cigarette smokers	Chi square value	Df	P value	CI
<b>Sex</b>	53	77	35.246	1	<b>0.00</b>	--
<ul style="list-style-type: none"> <li>• Male</li> <li>• Female</li> </ul>	1	68				
<b>Education</b>	3	17	8.464	4	0.076	0.070-0.080
• Not literate	11	39				
• Primary	9	38				
• Secondary	18	31				
• Higher	13	20				
<b>Profession</b>	2	56	27.222	4	0.000	0.000-0.000
• House wife	10	24				
• Government	26	47				
• Private	9	13				
• Unemployed	7	5				
<b>Presence of hypertension</b>	18	36	1.760	2	0.483	----
• Yes	56	86				
• No		3				
• Don't know						
<b>Family history of CVD</b>	17	17	0.993	2	0.616	----
• Yes	38	48				
• No	20	59				
• Don't know						
<b>Experience any CVD event (MI, HF)</b>	1	45	6.833	2	<b>0.027</b>	
• Yes	5	93				
• No	8	47				
• Don't know						
<b>Family history of diabetes</b>	17	38	0.560	2	0.756	0.765-0.782
• Yes	17	48				
• No	20	59				
• Don't know						