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Research Paper

Lifestyles and Non-Communicable Diseases Smoking: Part I Cardiovascular Diseases, Respiratory Diseases, Obesity, Depression and Liver Diseases

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ABSTRACT
Smoking is a popular addiction all over the world. Unfortunately, cigarette smoke is extremely harmful to human health. The toxic effects are noted in almost every organ of the body. It is associated with several non-communicable diseases and greatly increases mortality. This communication deals with the deleterious effects of smoking on five major non-communicable diseases, namely, cardiovascular, and respiratory diseases, obesity, depression, and liver ailments. Part II discusses the harmful effects of smoking on cancer, diabetes mellitus, kidney diseases, Alzheimer's disease, and arthritis.

KEYWORDS: *smoking, non-communicable diseases, cardiovascular diseases, COPD, obesity, depression, liver diseases*

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I. INTRODUCTION

Noncommunicable diseases (NCDs) such as cancer, diabetes, and cardiovascular diseases are the leading causes of death globally [1]. Modifiable behavioral risk factors such as smoking tobacco, inadequate vegetable and fruit consumption, excessive alcohol consumption, physical inactivity, and obesity show a strong association with an increased risk of NCDs and mortality from such diseases [2]. Tobacco smoking is a major player in this deleterious association. Although smoking has shown a downward trend in some developed countries, it continues to be popular in developing countries. It is estimated that in 2017, 25% of the men and 5.4% of the women, in the world smoked [3].

Smoked tobacco products include cigarettes, water pipes, bidis, and krekets [4]. Non-smoked tobacco is also commonly consumed, as loosely chewed tobacco leaves, snus, naswar, gutka, snuffs, and tobacco paste [5]. The main motivating factor for an individual to use tobacco products is nicotine—a highly addictive tobacco alkaloid. Besides nicotine, tobacco products contain several thousand chemical compounds, either gaseous or particulate, and at least 60 of these are toxic [6]. Smoke inhalation is generated in several ways – direct inhalation from a cigarette is first-hand smoke, side-stream cigarette smoke and smoke exhaled by the smoker results in second-hand smoke, while residue from tobacco products, that cling to surfaces such as skin, hair, clothing, and furniture, constitutes third-hand smoke.

These compounds enter the human body when tobacco is smoked or otherwise consumed. The result is an increased propensity to develop and worsen several communicable and NCDs. Besides imparting a higher risk of infectious diseases, especially URTIs and tuberculosis, cigarette smoke has been associated with complications of pregnancy, sudden infant death syndrome, and genetic diseases of the fetus [7]. Infants exposed to cigarette smoke either prenatal or after birth also increase their risk of orofacial clefts, periodontal disease, and dental caries. Cigarette smoking increases the risk of dental implant failure. Smoking enhances aging, with smokers developing premature wrinkles [8].

Cigarette smoking markedly reduces the quality of life - half of the smokers lose about 20 years of healthy life. A smokers' life expectancy is on average 10 years shorter than non-smokers. It is the leading preventable cause of death worldwide. Smoking was responsible for over 8 million deaths in 2017 [9]. Smoking cessation is effective in reducing morbidity and mortality. Smokers avoid more than 90% of the excess morbidity and mortality risk if they stop smoking before the age of 40. Almost all the risk is avoided in smokers who stop smoking at age 30. Jha et al estimated that despite an early start, cessation at ages of 30, 40, 50, or 60

years of age, results in a gain of about 10, 9, 6, and 4 years of life, respectively, compared to those who continue smoking [10].

II. DISCUSSION

CDC defines chronic diseases as "conditions that last 1 year or more and require ongoing medical attention or limit activities of daily living or both" [11]. Most NCDs are chronic diseases. They include cardiovascular diseases or CVD (including hypertension (HTN), coronary artery disease (CAD), stroke, and heart failure (HF)), cancers, chronic respiratory diseases (chronic obstructive pulmonary disease (COPD), sleep apnea, and asthma), diabetes mellitus, Alzheimer's disease, chronic kidney disease, arthritis, depression, obesity, and several liver diseases (nonalcoholic and alcoholic hepatitis, viral hepatitis, cirrhosis of liver). NCD related morbidity and mortality are growing globally. The number of deaths from heart disease has increased over fourfold, from 2 million since 2000, to nearly 9 million in 2019 [12]. Stroke is now responsible for 11% of all deaths. Deaths from cancers of the trachea, bronchus, and lung have risen from 1.2 million to 1.8 million and are now ranked 6th among leading causes of death [13]. Obesity is a pandemic and is responsible for an increase in global morbidity and mortality [14]. Depression cases worldwide registered an increase of 49.86% - incident cases increased from 172 million in 1990 to 25,8 million in 2017 [15]. Depression affects both mental and physical health and increases the rates of suicide and overall mortality. Depression is a major factor contributing to global disability. Liver diseases are also on the rise worldwide [16].

Several personal factors play an important role in the genesis and progression of NCDs - non-modifiable risk factors include heredity, age, race, and gender. NCDs are also dependent on several socioeconomic, cultural, political, and environmental factors. Lifestyles are modifiable risk factors and have a major impact on NCDs. One major lifestyle that is detrimentally associated with NCDs is smoking. The relationship between smoking and cardiovascular diseases, respiratory diseases, obesity, depression, and liver diseases is discussed in this Part I of the manuscript.

2.1 Cardiovascular Diseases

CVDs lead to all chronic diseases, both in morbidity and mortality, globally [17]. CVDs include coronary heart disease, HTN, stroke, heart failure, cardiac arrhythmias (including atrial fibrillation (AF) and sudden cardiac death (SCD)), peripheral arterial disease (PAD), venous thromboembolism (VTE), and vasculogenic erectile dysfunction (ED). Smoking remains the main modifiable lifestyle factor responsible for most CVDs [18]. Even low-tar cigarettes and smokeless tobacco have been shown to increase the risk of cardiovascular events when compared to non-smokers [19].

Tobacco smoking has significant deleterious effects on the cardiovascular system. There is an acute increase in systolic and diastolic blood pressure, total systemic vascular resistance, pulmonary artery pressure, and pulmonary vascular resistance [20]. Cigarette smoking enhances atherosclerosis via increased inflammation, thrombosis, and oxidation of low-density lipoprotein [21]. Several epidemiologic studies have indicated that there is an increase in the incidence of myocardial infarction and fatal coronary artery disease with smoking. Active smoking increases the coronary artery disease risk by about 80%. The risk is also increased in passive smokers (exposure to environmental or second-hand tobacco smoke) by about 30% [22]. Heart failure is increased, because of the effects of cigarette smoking on hypertension, peripheral resistance, and ischemic heart disease. However, due to additional effects, such as smoking-related carbon monoxide exposure and worsening renal function, it is also an independent risk factor for heart failure [23]. Cigarette smoking also increases the risk of stroke and AF. SCD, usually due to ventricular arrhythmias, is also increased in smokers [24]. Smoking is strongly associated with PAD and the risk of developing abdominal aortic aneurysms [25,26]. It has been established as an independent risk factor for the development of ED, while also increasing the risk of VTE [27,28]. CVDs are the leading cause of non-communicable disease mortality. It is projected that the prevalence of death from CVDs will be greater than 23.6 million people by 2030. Cigarette smoking is responsible for one in four of these CVD deaths. It is estimated that the mortality rate from CVD in smokers is double of that encountered in nonsmokers. Smokers lose an average of 10 years of life [29]. This is significant, especially when compared to a loss of <3 years with severe hypertension and <1 year with mild hypertension [30]. Smoking cessation decreases the risk of incident CVD, and this risk decreases more as the duration of cessation increases. Smoking cessation also results in a lower risk of death, especially if smoking is stopped at a younger age.

Smoking promotes atherosclerosis via vasomotor dysfunction, inflammation, and modification of lipids There are also prothrombotic alterations in platelet function, antithrombotic/prothrombotic factors, and fibrinolytic factors [31]. Smoking may also be a risk factor for coronary vasospasm [32]. Cigarette smoking remains the leading cause of preventable death from cardiovascular disease

2.2 Respiratory Diseases

The main respiratory diseases, plaguing humans are lung cancer, COPD, asthma, and respiratory infections' Lung cancer is discussed in Part II of this communication, under cancer. COPD is a major non-communicable disease, inflicting a significant morbidity burden. It affects about 3% of the population worldwide. COPD is a progressive and debilitating disease that causes a decline in lung function leading to cor-pulmonale and respiratory failure. It causes significant respiratory symptoms and these exhibit frequent exacerbations. It eventually causes death. COPD is responsible for over 3 million deaths annually [33]. The WHO predicts that COPD will be the third leading cause of death worldwide in 2030 [34]. Direct and indirect costs associated with COPD are estimated to be billions of dollars.

Cigarette smoking is the most important risk factor for COPD. The lifetime risk for smokers of getting COPD is estimated to be over 20% [35]. Other types of smoking, like water pipe smoking, have also been causally associated with COPD. Overall, smokers are 4.01 times more likely to develop COPD than nonsmokers. Electronic cigarette smoking may be less harmful to the lungs than conventional cigarettes and their use may help ameliorate COPD exacerbation rates and outcomes. Secondhand smoke exposure, in either childhood or as an adult, is also associated with an increased risk for COPD-associated mortality [36]. Cigarette smoke exposure in patients with COPD increases their risk of getting respiratory infections. COPD patients, both current and ex-smokers also exhibit an increased risk for lung cancer, cardiovascular diseases, and diabetes [37]. Smoking cessation is extremely beneficial for COPD sufferers, with an amelioration of symptoms and attenuation in the rate of annual pulmonary function decline. They experience an improvement in overall health and quality of life. Smoking cessation improves survival and increases life expectancy [38]. Besides COPD, asthma is also a major disease of the respiratory tract. Smoking increases the risk of developing asthma 1.81 times (81%) when compared to nonsmokers [39]. Smoking also increases the incidence of exacerbations and poor control in these patients. Second-hand smoke exposure, especially in children, increases asthma-related hospitalizations.

Smoke affects the lungs in several ways - it activates reactive oxygen species inducing oxidative stress and apoptosis while e-cigarettes induce inflammation, retard muco-ciliary clearance and alter the histologic alveolar histology [40].

2.3 Obesity

Bodyweight is generally recorded as body mass index (BMI) [41]. Normal BMI is 18.5–24.9 kg/m^2, overweight is a BMI 25 to 29.9 kg/m^2, while BMI in obesity exceeds 30 kg/m^2. Central obesity or abdominal obesity confers worse health effects, especially cardiovascular. Central obesity is determined by waist circumference or waist-to-hip ratio [42]. Unfortunately. children and adolescents all over the world are experiencing excessive weight gain at a rapid pace. Elevated BMI is associated with several chronic diseases and these include diabetes mellitus, cardiovascular diseases, cancer, and many other chronic ailments. Obesity also increases all-cause mortality [43].

Smokers have a higher waist circumference than non-smokers. and a higher waist-to-hip ratio as compared to non-smokers, with the ratio increasing with higher levels of smoking [44]. CAT scans reveal that they also have a higher visceral adipose to subcutaneous adipose ratio. Smokers have adverse fat distribution, and the result is central (abdominal) obesity [45]. This is most prominent in those smoking >20 cigarettes a day. This central obesity in smokers increases the risk of several chronic diseases in these individuals. It also increases mortality, especially in those with a BMI $\geq$35 kg/m^2 [45].

However, the relationship between obesity and tobacco smoking is bi-directional. Taking up smoking may help reduce obesity, possibly because of a reduced appetite in smokers. However, higher levels of obesity increase the risk of individuals taking up smoking, as well as increasing the smoking intensity. Quitting smoking may also cause weight gain but the net effect is still better health [46]. Most of the effects of cigarette smoking on body fat distribution appear to be driven by nicotine, both in central and peripheral tissues.

2.4 Depression

Depression is a leading cause of disability and premature mortality, affecting roughly 350 million people worldwide. Depression is a common illness that seriously affects both the physical and mental health [47]. It is characterized by sadness, loss of interest and pleasure, feelings of guilt, feeling of worthlessness, low appetite, fatigue, and poor concentration. It is a risk factor for many physical disorders. People with depression sometimes complain of physical symptoms, even without apparent physical ailment. Susceptibility to depression is affected by diverse hereditary, epigenetic, environmental, and endocrine factors. It affects approximately 17 percent of the population in the United States. It is associated with enormous personal suffering and societal economic burden. Further, depression can be a lethal illness with an elevated suicide risk. It also increases cardiovascular, cerebrovascular, and other medical causes of mortality [48]. There was an increase in the number of people suffering from depression between 2005 and 2015 by 18.4%. In 2015, 4.4% of the global population was suffering from depression and its prevalence was more common among females (5.1%) than

males (3.6%) [49]. Depression can be long-lasting or recurrent and affects people's ability to work and cope with daily life. The Global Burden of Disease Study 2016 reported that more than 34 million all-age disability-adjusted life-years were attributed to depression [50]. Depression increases all-cause mortality.

There is an important relationship between cigarette smoking and incident depression [51]. On the other hand. smoking is more common amongst individuals with depression. In UK, estimates suggest that up to 31% of individuals with depression smoke when compared with around 15% of the general population [52]. Smoking is also strongly associated with depression severity. A study by Johnston et al. of 1218 high school students, revealed that heavy smokers tend to grow more depressed while those with depressive symptoms are more likely to increase smoking, over time [53]. The relationship is therefore bidirectional. Secondhand smoking and depressive symptoms are also associated, Depressed patients who smoke often suffer from a reduced lifespan, and this is mainly driven by smoking-related diseases [54]. A potential biological mechanism for causal effects of smoking may be nicotine-induced disruption of neurotransmitters such as serotonin [55].

2.5 Liver Diseases

Liver diseases cause a considerable amount of morbidity and mortality. Alcoholic liver disease comprises a clinical-histologic spectrum including non-alcoholic fatty liver (NAFLD), alcoholic liver disease, cirrhosis with its complications, and liver cancer [56]. NAFLD is commonly seen in obese individuals [57]. Alcoholic liver disease is a major cause of diseases such as fatty liver, alcoholic hepatitis, and cirrhosis. Fatty liver is seen in more than 90% of all heavy drinkers, while about 25% develop alcoholic hepatitis and 15% cirrhosis [58]. Hepatocellular carcinoma has a poor prognosis with less than 10% living beyond 5 years [59].

Almost 90% of alcoholics smoke and most smoke at least one pack of cigarettes per day [60]. Chronic smokers are also more likely to consume alcohol in excess. Smoking is extremely harmful for alcoholics and more alcoholics who smoke die from smoking–related illnesses than from alcohol–related causes [61]. Smoking also increases the risk of liver cirrhosis independent of alcohol intake]62\. Individuals exposed to smoke increase the risk of NAFLD by about 38% [57]. Patients with hepatitis B who smoke increase their risk for the development of hepatocellular cancer [63]. Smoking is harmful for individuals with hepatitis C, with an increased risk of complications including steatosis, fibrosis, and hepatocellular carcinoma [63]. Smokers also tend to delay or defer their hepatitis C treatment. Finally, liver cancer is not only related to smoking, but the latter also increases its related mortality [64].

III. CONCLUSION

Tobacco is highly addictive. Smoking tobacco harms nearly every organ of the body. It increases the risk of acquiring several NCDs, including cardiovascular, respiratory, and liver diseases. It also accelerates their progression. It remains the leading preventable cause of death in the world. Second-hand and third-hand exposure to tobacco smoke is also harmful. Smoking cessation yields valuable health and longevity benefits. Smoking is a major health hazard and smoking cessation is a beneficial lifestyle intervention.

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