

# Chronic obstructive pulmonary disease in Middle East and UAE: an unrecognized underestimated epidemic

## Abstract

Smoking and Chronic Obstructive Pulmonary Disease (COPD) are increasingly becoming common in Middle East and UAE with consequent significant morbidity, adverse quality of life of patients, mortality and health care cost. Despite persistently increasing in the incidence and prevalence of COPD, it is mostly unrecognized by the patients, under diagnosed and undertreated in this part of globe with consequent effects. The purpose of this review article is to emphasize the factors (specific to Middle East and UAE) leading to rise in prevalence of COPD in Middle East and UAE and to brought in to light the under management issue of COPD and to give suggestions to the health department for the the corrective measure to diagnose COPD early and correctly, to formulate policies and to generate awareness among general public about the side effects of smoking and consequences of COPD.

**Keywords:** COPD, middle east; UAE, incidence and prevalence of smoking, risk factors, Water pipe, Shisha, Midwakh smoking

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**Abbreviations:** COPD, chronic obstructive pulmonary disease; GOLD, global initiative for chronic obstructive lung disease;  $\alpha$ 1-AT, alpha1-antitrypsin deficiency; CAT, COPD assessment test

## Introduction

Chronic Obstructive Pulmonary Disease (COPD) is defined by the Global initiative for chronic Obstructive Lung Disease (GOLD) as “a common preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases”.<sup>1</sup>

COPD is a leading cause of morbidity and mortality worldwide. In 2001, the Global Burden of Disease project identified COPD as the sixth leading cause of mortality in middle- or low income countries accounting for 4.9% of total deaths.<sup>2</sup>

According to the latest WHO estimates (2004), currently 64million people have COPD and 3million people died of COPD<sup>3</sup> WHO predicts that COPD will become the third leading cause of death worldwide by 2030.

Another study in USA, identified COPD as the fourth leading cause of chronic morbidity and mortality<sup>4</sup> and continue to rise steadily, Although around 90% of deaths due to COPD occur in low- or middle-income countries, scarce data are available in these countries on the prevalence of COPD.

Although COPD is not a curable disease, elimination or reduction of risk factors can prevent the development or slow down the progression

of the disease. The main risk factors for the development of COPD are cigarette smoking, exposure to air pollutants resulting from the burning of wood or other biomass fuels, tuberculosis, occupational exposures and increasing age.<sup>5</sup> The increase in prevalence of COPD is directly related to the increase in prevalence of smoking worldwide, particularly among women and adolescents.

Purpose of this review article is to present the current status of smoking and prevalence of COPD and its consequences in UAE along with comparison with GCC countries.

## Discussion

### Tobacco smoking

**Global pandemic:** Smoking is a major risk factor for development of COPD than other types of tobacco, and may be predictive of COPD morbidity and mortality with all the adverse consequences.

As per WHO (2008) tobacco caused one in ten deaths in adults worldwide, corresponding to a total of five million deaths per year.<sup>6</sup> In 2000, the estimated rate of mortality attributable to smoking in the adult population (aged >30years) was 19% in industrialized countries and 9% in developing countries.<sup>7</sup>

Moreover, it has been estimated that the tobacco epidemic may kill one in six adults corresponding to 10million people annually in the next 20-30years, with 70-80% of these deaths occurring in developing countries.<sup>8</sup>

Although current research, treatment, and administrative policies

primarily focus on cigarettes, many people in developing regions smoke tobacco using water-pipes<sup>9</sup> which also increases the risk of COPD, lung cancer & other respiratory problems.<sup>10</sup> The nicotine exposure from daily water-pipe use was estimated to be equivalent to smoking 20 cigarettes/day<sup>11</sup> and water pipe smokers report features of dependence such as drug-seeking behavior and an inability to quit despite repeated attempts although water-pipe smokers have a misconception that this is harmless the rationale being that the smoke is filtered and the noxious particles are absorbed by water.<sup>12</sup>

A recent study performed in adult former or current smokers in the USA showed that exposure of cigarette smokers to wood smoke, for example from barbecues and cooking stoves, increases the risk of airflow obstruction and chronic bronchitis.<sup>13</sup> This holds true for UAE also, because many people (especially Arabs) are using barbecues as a part of outing and socializing habits. Being a newly developed country, the older population was using biomass fuel as the principle source of cooking in the past with consequent exposure to smoke and risk of developing COPD at a later age.

### Smoking

A global pandemic continuing in Middle East and United Arab Emirates (UAE): Recently conducted Breathe study revealed that the adjusted smoking rate in the general population of the participating MENA countries was estimated to be 31.2%, ranging from 15.3% in Morocco to 53.9% in Lebanon. The smoking rate in men ranged from 29.7% in Morocco to 61.0% in Turkey, whereas in women it ranged from 1.4% in Morocco to 47.3% in Lebanon. Overall, the highest rates were detected in Jordan, Lebanon, Syria and Turkey.<sup>14</sup> Although it was difficult to compare the smoking rates for individual countries in breathe study due to differences in the populations evaluated. Nonetheless, the gender-specific smoking rates reported in this study were comparable to those previously reported studies. For example, current smoking rates in men in these studies have previously been reported to varied from 58.0% in Turkey, 48.6% in Algeria, 37.7% in Egypt, ~50% in Jordan, 55.2% in Lebanon, 31.5% in Morocco, 56.9% in Syria, and 28.1% in UAE.<sup>15-22</sup>

In addition, in these national studies, published current smoking rates in women are generally very low and range from 0.5% in Egypt to 44.8% in Lebanon, 6.8% in Algeria, 10% in Jordan, 3.1% in Morocco, 17.0% in Syria, and 2.4% in UAE.<sup>15-22</sup> Overall, tobacco use has been associated with many factors including social status, education, age, employment status, level of incomes, marital status, psychological status and religious beliefs.<sup>23</sup> The differences in the smoking rates between men and women found in breathe study are well described in this region of the world.<sup>24</sup> In many of these countries women have restricted access to public places where cigarettes are traditionally smoked, such as cafes and markets. While smoking by men is seen as common and “normal”, smoking by women may be considered inappropriate and shameful. However, in the last few years smoking rates in women have increased rapidly.<sup>25</sup> possibly under the influence of social customs in developed countries,<sup>26</sup> media and proactive marketing efforts by cigarette companies. Smoking in women is also influenced by the increasing number of professionally active women and smoking is considered as a sign of the emancipation of women, associated with higher educational and professional level whereas in men it is associated with a lower educational level.<sup>25</sup> Finally, local smoking rates in women may differ more than in men according to geographical area. For example, women living in urban or high-income areas in Morocco smoke 3 times more than the national smoking rate in women. When comparing the smoking rates

in women between countries, Lebanese women have high prevalence of smoking this may be due to socio-cultural factors, since Lebanon is considered the most ‘Westernized’ and largely urbanized society amongst the MENA region.<sup>27</sup>

### Current status of COPD in UAE

Smoking and consequent COPD is a growing problem in MENA region due to the lack of awareness of the risks associated with smoking. It is worth notice and interesting that in the MENA region and in UAE, COPD is largely underdiagnosed/misdiagnosed and hence undertreated/inappropriately treated until it is moderately advanced or advanced due to lack of standardized methods to diagnose COPD, very low general awareness, indifferent attitude among physicians and general public, high incidence of smoking and environmental pollution, non-implementation of health regulations to stop smoking and the dictum that “everything that wheezes is asthma” leading to under diagnosis of COPD and over diagnosis of asthma.

Many people in this region still consider smoking as a socializing factor as a part of their daily lives. In this region, tobacco smoking, water pipes (narghile, hookah), use of hashish, and the lack of laws and regulations banning smoking and water pipes in coffee houses and other public places are major contributors to first and second-hand smoke.<sup>28</sup> Water pipe smoking is prevalent among women and young generation because there is less of a cultural stigma attached to it than to cigarette smoking.

### Smoking prevalence and smoking habits in middle east & UAE

In the 2011 WHO report on the global tobacco epidemic, smoking rates in the Middle East and North Africa (MENA) region ranged from 15.1% in Morocco to 38.5% in Lebanon. The smoking rate in men ranged from 20.2% in Saudi Arabia to 62.0% in Syria, whereas in women it ranged from 0.2% in Morocco to 31.5% in Lebanon.<sup>29</sup>

One large study involving n=170,430 UAE nationals, aged ≥18years to determine the prevalence and modes of tobacco consumption in UAE particularly focusing on the use of Midwakh (Arabic traditional pipe) revealed the overall prevalence of smoking was 24.3% in males and 0.8% in females and highest in males aged 20–39years. Mean age of smokers was 32.8±11.1years.

Cigarette smoking was the commonest form of tobacco use (77.4%), followed by Midwakh (15.0%), shisha (water pipe- 6.8%), and cigar (0.66%). The mean durations of smoking for cigarettes, Midwakh, shisha ranged between 7.6 and 11.4years. They concluded that Smoking is most common among younger UAE national men. The use of Midwakh and the relatively young age of Midwakh smokers is of particular concern as is with the possibility of the habit spreading to nearby countries. They suggested that comprehensive tobacco control laws targeting the young population and the banning the use of Midwakh are needed.<sup>30</sup>

According to the Ministry of Health percentage of cigarette consumers was 18.3% among males and 0.4% among females in 1995 which reached 28.1% among male adults and 2.4% female adults in 2003.

The statistics showed that the consumption of cigarettes increased among males from 14.9% to 17.1% in 2009- 2010. The total number of adolescents tobacco consumers in 2005 increased from 12.7% to 15.3% in 2010.<sup>31</sup> Another preventive showed that the number of smokers in the UAE reached nearly 30%. The tobacco consumption

international survey among the youth and adolescents (2002-2005) revealed that 22.36% of school students (aged 13-15 years) were smoker (30.7% are boys and 14.2% are girls) and about 10% of the tobacco consumers use cigarettes.<sup>32</sup>

Another more striking cross sectional study identified the extent of smoking among physicians in UAE revealed that 34% physicians were current smokers, n=32 were ex-smokers (14.9% v/s 4.9% females). This small study shows very high proportion of smoking in the physicians and if we extrapolate these findings for total number of physicians in UAE then it would be a huge number. This study clearly reflects the magnitude of smoker physicians and surprising to know that how they would be advising smoking cessation to their patients.

Further analysis revealed that most important factors for non-smoking doctors for not smoking were: 'Protection of health', 'Self-discipline' and "To set a good example to others". The results revealed that less than 50% of physicians provide information to over 70% of smoking patients.<sup>33</sup>

## Epidemiology of COPD

### Global scenario

There is wide variation in the epidemiological prevalence of COPD around the world primarily due to the method of diagnosis and classification of COPD. It is speculated that the estimated prevalence would be higher when spirometry along with symptoms and risk factors is used for diagnosing COPD rather than with methods using symptoms alone.<sup>34</sup> The Burden of Obstructive Lung Disease (BOLD) study from 12 centers found that the overall prevalence of COPD of GOLD stage II or higher was 10.1% with large differences between countries.<sup>35</sup>

The multi center PLATINO study in Latin America reported that the prevalence of airway obstruction was 14.3% and the proportion of subjects in stages II- IV of the GOLD classification was 5.6%.<sup>36</sup> In addition, multi-center surveys of COPD in single countries have been conducted in Switzerland and Spain, and studies have been coordinated across many European countries simultaneously in the European Community Respiratory Health Survey (ECRHS) and BOLD study. However, estimates of mortality, hospital admissions, prevalence and incidence are still lacking from many European countries in 2012.

### UAE scenario

UAE has a population of approximately 9.3 million (population density 110 people per km<sup>2</sup>), native emaratis make up only 9% of the population whereas immigrants from all over the world make up 91% of the population) among which there are large differences in population structure and health services and great environmental, genetic, socio-cultural and psychological heterogeneity among the resident population. UAE is therefore an ideal region to explore environmental as well as genetic influences on the epidemiology, pathogenesis, characteristics and burden of disease, hospital admission rate, morbidity and mortality due to COPD. Unfortunately, in MENA region as elsewhere in the developing world, available data on the epidemiology of COPD are limited. Although several local studies have been performed,<sup>30,37</sup> these has not always been done as population based or nationwide or standardized population and hence varied with respect to the age group, population studied and the methodology used. For these reasons, the data obtained are difficult

to compare between local studies and with those obtained from other regional initiatives into the epidemiology of COPD such as BOLD, PLATINO and Confronting COPD.<sup>35,36,38</sup>

Recently a large population- based international epidemiological study of COPD in the MENA region (BREATHE study) was carried out in eleven countries using a consistent standardized methodology (which was used in the Confronting COPD surveys) with the objective of collecting standardized population-based data including epidemiology, burden, management and resource consumption on COPD in MENA region that can be fairly compared with data from other regions of the world.<sup>39</sup>

In a recent Lebanese study, among the 2201 individuals the prevalence of COPD was 9.7% (95% CI: 8.5%–10.9%). Only 20.2% of these COPD patients had already been diagnosed and treated by a physician. Distribution of COPD patients as per COPD stage was as follows: 17.6% mild (Stage I), 58.3% moderate (Stage II), 20.3% severe (Stage III) and 3.8% very severe (Stage IV).<sup>40</sup>

A cross-sectional study with the objectives of Case-finding of COPD with copd questionnaire, peak flow measurements and spirometry revealed that The lowest age and gender-adjusted prevalence was in the United Arab Emirates (UAE) with 1.9% of participants (95% CI 1.4 to 2.4).<sup>41</sup>

In another cross-sectional survey to find out the prevalence of COPD in Abu Dhabi, with a particular interest to explore local risk factors other than cigarette smoking the prevalence of COPD was found to be 3.7% (95% CI - 2.0-5.3). There were no differences by gender, and COPD prevalence only significantly increased in those 70 year and older. Among those with COPD, cigarette smoking use was relatively low (12% current and 12% former-smokers), and it was even lower than the use of shisha (5%), pipe (0%), or exposure to passive smoking (5%), while exposure to biomass was higher (33%). Interestingly, bakhour use was very high (78%), but neither bakhour nor any of the above-mentioned exposures were associated with the risk of COPD although bakhour use has been found as an exacerbating factor in asthma.<sup>37</sup>

Same authors emphasized on potential new risk factors (Shisha smoking and scent/bakhour inhalation which is unique to the Arabic culture for COPD found that the COPD prevalence in U.A.E. was 4.6%, which was comparable to other countries.<sup>42</sup>

### Other risk factors for COPD relevant to MENA and UAE

Although the development and progression of COPD is multifactorial including complex interplay of genetic and environmental factors. In view of large number of immigrant population in UAE, this holds truer and most of the genetic factors which are potentially contributing to COPD in UAE are unknown due to lack of studies.

**Environmental factors:** Important environmental factors associated with COPD are outdoor air pollution, occupational exposure to dusts and fumes, biomass smoke inhalation, exposure to second-hand smoke and previous tuberculosis. Although tobacco smoking is the most important cause of COPD, the population-attributable fraction for smoking as a cause of COPD ranged from 9.7 to 97.9%. A Swedish cohort study had observed that population-attributable fraction for smoking as a cause of COPD was 76.2%.<sup>43</sup> Passive smoking in childhood and young age may predispose for COPD

**Outdoor air pollution:** Outdoor air pollution mainly from emission of pollutants from motor vehicles and industries is an important public health problem in the developed world. In a community-based study, it has been observed that higher traffic density was significantly associated with lower FEV1 and FVC in women<sup>44</sup> In the Danish Diet, Cancer and Health cohort study involving 57,053 participants, it has been shown that COPD incidence was significantly associated with nitrogen dioxide levels.<sup>45</sup> Particulate pollutants, ozone and nitrogen dioxide can produce bronchial hyper reactivity, airway oxidative stress, pulmonary and systemic inflammation, however, a causal relationship between outdoor air pollution and COPD is still not established.

Dubai Municipality conducted the survey and found that the city rank among the worst in the developed world using an On-road Vehicle Emission Measurement device, which assigns a percentage score for the levels of harmful pollutants including hydrocarbons, carbon monoxide, nitrogen oxides, and carbon dioxide.

Over a 10-month period (May 2007 - February 2008), Dubai scored 13%, compared to 2.5% in Virginia, 2% in Michigan, and 4.7% as an average across Canada.<sup>46</sup> The scoring system assigns a higher percentage based on two variables: the volume of cars on a road during the testing period, and the level of emissions from each vehicle. On both counts, Dubai scores badly in comparison to developed cities: there are more cars on the road at any one time, and each car is spewing out more pollution and this problem getting worse every day.

Two factors point to a worsening air pollution situation in Dubai- the rapid pace of urbanization and motorization. Dubai's statistical data showed that motor vehicles increased by an annual average of about 12%. Dubai has about 541 vehicles per thousand populations, which is higher than New York (444), London (345) and Singapore (111). Frequent dust storms may also leads to acute exacerbation of COPD.

**Rapid industrialization and urbanization:** Construction of thousands of multi-stories buildings in last 20years with the significant potential exposure to the construction dust to the labors and residents of neighborhood buildings could have significant impact in the development of COPD especially in young/middle age population.

**Indoor air pollution:** Important indoor air pollutants are environmental tobacco smoke, particulate matter, nitrogen dioxide, carbon monoxide, volatile organic compounds and biological allergens<sup>46</sup> Among these, environmental tobacco smoke<sup>47,48</sup> and biomass smoke exposure are related to the development of COPD.

Biomass (wood, crop residue and animal drug) are burnt in rural areas using substandard stoves in poorly ventilated indoors. Women, spending more time indoors for cooking than men, are exposed to biomass fuel combustion products and are prone to develop COPD.<sup>49,50</sup>

A meta-analysis has shown that biomass smoke exposure was a risk factor for developing COPD in both women and men.<sup>49</sup> In view of the rapid urbanization and no or minimal use of biomass fuel for cooking now a days, indoor air pollution won't be contributing factor for the younger generation but it could be contributory to the development of COPD in old generation when the biomass fuel was the main source.

In Gulf countries, Arabian incense (bakhour) is one of the common indoor smoke sources to which individuals are frequently exposed, and may be an important contributory factor to the observed high

prevalence and severity of asthma in children of this region.<sup>51</sup> Many studies has shown bakhour as consistent factor for worsening of asthma symptoms and wheezing especially in children, Unfortunately no studies have been done to establish bakhour as a cause for development and/ or worsening of COPD, however considering that slow and incomplete combustion of bakhour, (Incense) burning produces continuous smoke, generating pollutants such as toxic gases and chemicals particles including polycyclic aromatic hydrocarbons, carbon monoxide, benzene, and isoprene that easily accumulate indoors, especially under inadequate ventilation<sup>52</sup> which could be a indoor risk factor in the development of COPD in Mena region.

One recent study conducted with the goals to characterize the particles and gases emitted from Arabian incense revealed that Carbon mono-oxide and oxides of nitrogen concentration in the time-weighted averages exceeded current government regulation values and emissions seen previously from environmental tobacco smoke. Charcoal emissions were the main contributor to both the high CO and NOx concentrations. A significant cell inflammatory response was observed in response to smoke components formed from incense burning. Our hazard evaluation suggests that incense burning contributes to indoor air pollution and could be harmful to human health.<sup>53</sup>

**Genetic factors:** Alpha1-antitrypsin ( $\alpha$ 1-AT) deficiency is an established genetic cause of COPD especially in the young and it has been reported that  $\alpha$ 1-antitrypsin deficiency occurs in 1-2% of individuals with COPD.

Recent Saudi Arabian study among healthy individuals genotyping showed that 2.53% were heterozygous for Z mutation, 11.39% were heterozygous for S mutation and 3.8% for SZ. Homozygous for SS was present in 1.9% of individuals and no ZZ phenotype was detected<sup>54</sup> however there is no data from UAE about the  $\alpha$ 1-AT deficiency in healthy individuals or COPD patients.

**Other risk factors:** Other risk factors associated with COPD and reduced FEV1 are occupational exposure to dusts and fumes, previous tuberculosis, maternal smoking, childhood asthma and childhood respiratory infections.<sup>55</sup>

## Current status of COPD in UAE

### A recent multicenter international study revealed following points

**Health care resource consumption in UAE due to COPD:** Due to high prevalence of smoking in UAE, significant health resources are being used (actually wasted) for COPD however one recent study in UAE revealed that Only 55.55% patients had PFT performed at least once in the past while 12(44%) patients had done lung function test in last year. Around 50% of pts were using bronchodilators without corticosteroids, long acting bronchodilators.<sup>56</sup>

This Data and other studies from Tageldin et al.<sup>57</sup> showed that after extrapolation of Data from national population census national healthcare resource consumption due to COPD. Total population of 4,106,427 with population more than 40 yrs of age being 837,711, considering the prevalence of COPD 1.9%. 59.3% patients consulted physicians, the mean number of consultations being 4.6 $\pm$ 4.9. Of these only 43.8% patients visited pulmonologists. 40.7% patients stayed overnight or longer in hospital, the mean number of hospitalization days was 2.4 $\pm$ 1.6 while mean number of emergency room visits was 4.5 $\pm$ 5.1. Hence, Physician consultations were the most frequently

used healthcare resource followed by emergency room visits and hospitalizations in the descending order.

CAT test assessment result revealed that 55.6% of COPD patients were in age group 40-49 years, predominantly males and 40.0% of patients were overweight or obese in the CAT surveyed population. The severity assessment of COPD patients revealed that COPD was mild to moderate in 95% and severe in 5% of patients. 80.0% of COPD patients had fair or good health. More than 40% of patients had some Comorbidities. Majority of COPD patients had educational level below high school.

### Future developments

Accurate information about the prevalence and types of tobacco use is essential to deliver effective public health policy. Implementation of effective public health strategies including education & awareness of general public, strict health regulations aimed to reduce smoking and to manage and prevent COPD is very important. The main obstacle to this is the lack of data related to prevalence and burden of COPD with consequent prohibition in the governmental health planning strategies to curb the incidence and prevalence of COPD.

There is a great deal of room for improvement in COPD care in MENA region, and current trends suggest the following developments are possible and desirable.

- i. More accurate data on illness, exacerbations, natural history, cost and deaths related to COPD, particularly in areas where no data is available, will provide a stronger foundation for fighting COPD.
- ii. Studies of the effectiveness of current prevention, education, medication, rehabilitation and terminal care will help to spread best practice and drive higher standards of COPD care.
- iii. New therapeutic modalities will inhibit the decline in lung function and improving the overall quality of life of COPD pts.
- iv. As smoking remains the key risk factor for COPD, following measures will reduce the burden of disease: more effective smoking cessation interventions and techniques to prevent people from starting to smoke and to quit smoking; better surveillance of harmful occupational exposures; and protection in early childhood against harmful exposure and events that affect the lung.
- v. Ministry of health and the general public need to be made aware of the high burden of COPD in MENA and these countries should implement common strategies for effective prevention, diagnosis and treatment of this disabling and life-threatening disease.
- vi. Research needs: Research is needed in following key areas related to COPD.
- vii. As smoking rates in UAE are increasing along with the rise in other risk factors to COPD with resultant increased incidence and prevalence of COPD. There is a need to know how this will affect the course, management, and prognosis of the disease along with effect on health care system.
- viii. Although spirometry is a prerequisite in COPD studies, more extensive characterization of disease than that offered by spirometry is required. Novel imaging techniques and biomarkers offer the potential to characterize subgroups, or phenotypes, of COPD. Cohort studies should be conducted to assess the long-term natural history of COPD and its phenotypes.

- ix. No data are available about the prevalence, incidence and natural history of various phenotypes of COPD, and their economic burden on UAE.
- x. Our knowledge of the pathogenesis of COPD and how this can be modified is still limited. Novel molecular and genetic techniques offer promising possibilities for gaining important knowledge on disease mechanisms, which opens up possibilities for development of new drugs.
- xi. No or limited data on how rapid industrialization, sand storms, chemicals & global warming will affect the risk factors and eventually the incidence of COPD.

### Suggestions to health authorities

Strict policies for control of sale and prohibit smoking near schools and public places and to impose big penalty to the violators.

To increase the tax-prices on tobacco and related products and tobacco merchandisers should be obliged to distribute packages displaying graphics stating the negative effects of the habit. However it is not sure whether these measures would really cut down the prevalence of smoking.

### Conclusion

COPD is grossly underdiagnosed/ undertreated in the Middle East and UAE due to a wide variety of reasons and its incidence and prevalence are on the consistent steep rise with significant health consequences. This is the right time to break the chain of factors which are predisposing to high prevalence of COPD in this part of globe.

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Ashraf Al Zaabi and Bassam H. Mahboub designed and performed the research, BHM & Mayank G. Vats analyzed the data and wrote the manuscript. Deepa M. Vats reviewed the manuscript and gave valuable suggestion.

### Conflict of interest

None of the authors/contributor of the manuscript has any conflict of interest or there is no financial disclosure required.

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