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Hookah Smokers, Beware!! Severe Erythrocytosis noted in Hookah Smokers: A Case Series of 13 Patients

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Abstract

Over the past decade, hookah smoking has become a popular way of smoking tobacco around the world. In this study, we explore the relationship between hookah smoking and erythrocytosis, a frequently encountered problem in Hematology clinics. Cawkwell et al. analyzed internet trends as a measure of population behaviour and revealed that New York is experiencing tremendous growth in hookah bars with an overwhelming majority located in New York City. As hookah smoking is not considered a traditional form of smoking, patients can often neglect this information when asked about their smoking history. We did a retrospective chart review of 13 patients with otherwise unexplained erythrocytosis and a history of hookah smoking. Our results showed the median age of the study group was 33 years (range, 22-60) and mean hemoglobin level was 19.16 g/dL. JAK2 mutation was negative and erythropoietin level was normal to high in all patients. No correlation was found between the intensity of hookah smoking and degree of erythrocytosis (Pearson correlation factor was -0.139). There is a popular belief that smoking tobacco through a hookah pipe is harmless however, studies showed that smoke from a hookah pipe can be equally dangerous to cigarette smoke and contains various toxicants that can cause a myriad of health problems. Our study showed that hookah smoking can cause significant erythrocytosis and should be considered as a possible etiology in the evaluation of unexplained erythrocytosis, especially in a young patient.

Keywords: Erythrocytosis; hookah; smoking; hemoglobin

Introduction

Tobacco smoking continues to be the number one preventable cause of morbidity and mortality worldwide despite the success of many evidence-based interventions and policies in reducing cigarette smoking. Globally, tobacco use and addiction are initiated and maintained by means other than cigarettes. The waterpipe, known in many cultures under different names (eg, hookah, shisha, narghile), needs a special mention in this regard. It is a centuries-old tobacco use method that was traditionally prevalent in Middle Eastern societies but has become a popular way of smoking tobacco all over the world in the past decade, especially among the youth [1].

A water pipe is essentially a device that consists of a head, body, and water bowl fitted with a hose and mouthpiece as shown in the picture. The head contains tobacco with charcoal placed on the top to make it combustible since tobacco is too moist to burn on its own. The body is fixed to the neck of the bowl which is half-filled with water and placed on the ground. The hose with a mouthpiece on one end is attached to an aperture on the side

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of the bowl. When the charcoal is lit, the smoker inhales through the hose. This creates a vacuum above the water, drawing air from over the charcoal and tobacco and through the body (Figure 1). The smoke created in due process bubbles through the water, gets diluted and cooled, and is inhaled by the smoker [2]. A systematic review investigating the prevalence of hookah pipe (HP) smoking analyzed 86 papers and showed that university students recorded among the highest prevalence estimates worldwide [3]. Cawkwell et al. analyzed internet trends in the United States as a measure of population behaviour and health phenomena. Their study showed that New York is experiencing tremendous growth in hookah bars with an overwhelming majority located in New York City. Alarmingly, significant geographical clustering of these bars wasnoted in locations where large populations of college students reside [4]. The disturbing rise in hookah smoking use particularly amongst younger age groups prompted the World Health Organization to declare HP smoking as a growing public health concern in its 2015 advisory note [3]. Contrary to data, there is a popular belief that smoking tobacco through a hookah pipe is less harmful than cigarette smoking. However, studies showed that smoke from a hookah pipe can be equally dangerous to cigarette smoke and contains various toxicants that can cause a myriad of health problems [5,6]. In this study, we explore the relationship between hookah smoking and erythrocytosis, which is a frequently encountered problem in Hematology clinics.

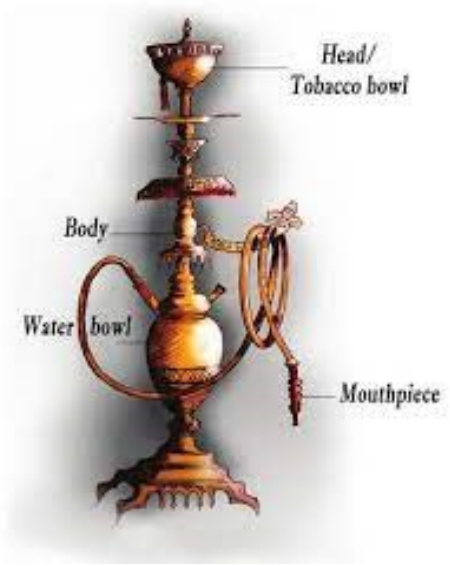

Fig 1: denotes water pipe

Methods

We did a retrospective chart review of 13 patients with otherwise unexplained erythrocytosis and a history of hookah smoking seen at BronxCare Health System between July 2019-December 2021. We looked at patient characteristics, intensity of hookah smoking, degree of erythrocytosis, and other contributing factors. We quantified hookah smoking intensity to look at the correlation between severity of smoking habit and hemoglobin levels at presentation and calculated correlation using the Pearson (-0.139) correlation test.

Results

All of the study subjects qualified to have erythrocytosis as per the definition, which is a hemoglobin (Hb) level greater than 16.5g/dL in men or 16 g/dL in women or hematocrit (Hct) greater than 49% in men or 48% in women. There were eleven males and one female and the median age was 33 years (range, 22-60). The mean hemoglobin level was 19.16

Table 1: summarizes patient characteristics, clinical presentation, Hb at presentation, EPO levels and JAK-2 mutation results.

	Age	Sex	Clinical Presentation	Hb at presentation (g/dL)	EPO level (2.6-18.5 mIU/mL)	JAK-2 mutation
Patient 1	22	M	Asymptomatic	18.1	10.2	Negative
Patient 2	29	F	Headaches, blurred vision	16.9	4.4	Negative
Patient 3	31	M	Asymptomatic	20.7	21.9	Negative
Patient 4	39	M	Asymptomatic	20.1	15.1	Negative
Patient 5	33	M	Asymptomatic	19.9	10.6	Negative
Patient 6	31	M	Headaches	21.5	3	Negative
Patient 7	32	M	Fatigue	18.7	9.6	Negative
Patient 8	33	M	Asymptomatic	17.2	6.2	Negative
Patient 9	43	M	Asymptomatic	19.4	8.2	Negative
Patient 10	48	M	Asymptomatic	21.5	5.1	Negative
Patient 11	60	M	Asymptomatic	20.1	10.7	Negative
Patient 12	24	M	Asymptomatic	17.9	7	Negative
Patient 13	34	M	Fatigue	17.2	5.1	Negative

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Table 2: outlines patients' history and investigations for secondary erythrocytosis; NA- not available

	Hookah smoking as per history	Cigarette smoking	BMI	Urine routine	Abdominal imaging	Sleep Study
Patient 1	Upto 1-2 hours/day	None	23.2	Negative	NA	NA
Patient 2	Upto 5 hours/ day, Especially on weekends	None	22.6	NA	NA	NA
Patient 3	Smokes everyday	None	34.4	NA	NA	NA
Patient 4	A lot of hookah daily	None	32.6	NA	NA	NA
Patient 5	1-2 times/day	None	30	Negative	Negative	NA
Patient 6	Almost daily	None	29.1	NA	NA	Positive
Patient 7	Occasionally	None	26.6	Negative	NA	NA
Patient 8	Last use 7 months ago	Yes	29.4	Negative	Negative	NA
Patient 9	Extensive until 3m ago, last use 3days ago	None	28.4	Negative	Benign liver cysts	Negative
Patient 10	Atleast once a week	None	27.2	Negative	NA	Positive
Patient 11	2 times/ day	None	31.7	Negative	Negative	NA
Patient 12	Smokes every 4 hours	None	27.9	NA	Negative	NA
Patient 13	2 times/day	None	24.1	NA	NA	NA

g/dL. The frequency of hookah smoking between patients ranged from less than once a week to every 4 hours. JAK2 mutation was negative and erythropoietin (EPO) level was normal to high in all patients (Table 1). All but four patients were asymptomatic at presentation. None of the patients had previous thrombosis or palpable splenomegaly or a family history of hematological diseases or malignancies. One patient had a concurrent cigarette smoking history, one patient had liver cysts (presumed to be erythropoietin-producing), and two patients had obstructive sleep apnea confirmed with a sleep study (Table 2). These factors, in addition to hookah smoking, could have presumably contributed to erythrocytosis in these patients. We quantified hookah smoking intensity to look at the correlation between severity of smoking habit and hemoglobin levels at presentation and calculated correlation using the Pearson (-0.139) correlation test. The intensity of hookah smoking was quantified by arbitrarily considering one hour/ week as one point. No correlation was found between the intensity of hookah smoking and degree of erythrocytosis. The Pearson correlation factor was -0.139.

Discussion

In recent times, communication revolution and globalization carried hookah smoking to every corner of the world in record time. It is popularly believed that smoke generated through hookah pipes is not dangerous and non-addictive. Several factors might have contributed to this widespread misconception including the fallacy that inhaled smoke has been 'detoxified' by the 'filtering' effects of water; introduction of fruit flavours that are perceived to indicate a healthy product or safe detoxified smoke; thriving cafe-culture and social acceptability; a dearth of information in the media about the dangers of hookah smoking; non-standardized manufacturing of HP apparatus; lack of product-specific interventions and regulations implying that it must be safer [1,7]. However, studies show that hookah smoke can be at least as dangerous as cigarette smoke. It was reported that expired carbon monoxide (CO) increased by 300% after an hour of smoking in HP smokers while it increased by only 60% in cigarette smokers [2]. Also, the plasma levels of carboxyhemoglobin (COHb) in HP smokers are 10 times higher than those observed in cigarette smokers [7]. The significantly higher COHb levels could be because the HP smoke is cooled as it passes through the water making it less irritating to the airways and allowing smoker to smoke more and longer. It could also be related to the fact that water-pipe smoking may be associated with larger second-hand smoke volumes as it is done in groups increasing the exposure to smoke over time. Additionally, a single water-pipe smoking session produces a 24-hour urinary cotinine level that is equivalent to smoking 10 cigarettes a day. Noxious substances such as nicotine, tar, and heavy metals (chromium, arsenic, lead) were also detected in the smoke of hookah pipes [2].

The dangers associated with HP smoking are numerous ranging from periodontal disease to intra-uterine growth restriction to cancers [6]. One among those is secondary erythrocytosis. Erythrocytosis (polycythemia) refers to an abnormal elevation of hemoglobin and/or hematocrit in the peripheral blood. Erythrocytosis can be primary erythrocytosis, caused by an acquired or inherited mutation in the progenitor red blood cells, or secondary erythrocytosis, caused by elevated serum EPO. Tissue hypoxia caused by CO is the main cause of secondary erythrocytosis in hookah smokers. CO is produced by the incomplete combustion of carbon-containing products, notably tobacco and charcoal in the hookah apparatus. Following inhalation, CO diffuses

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across the alveolar membrane and reversibly binds heme, forming carboxyhemoglobin. CO surpasses oxygen for available binding sites on hemoglobin as the affinity of CO to hemoglobin is 200-fold higher than that of oxygen. Consequently, oxygen delivery to the tissues is impaired causing hypoxia. In the body, chronic cellular hypoxia increases the expression of hypoxia-inducible factors (HIFs) by preventing their active degradation. These increase transcription of erythropoietin, which stimulates erythropoiesis, ultimately causing erythrocytosis [8].

Our study demonstrated that hookah smoking is associated with development of secondary erythrocytosis in otherwise healthy subjects. AlQahtany FS et al. reported that patients who smoked about 1 cigarette per day or 1.6 shishas per day had high normal hemoglobin levels and those who smoked about 1.3 cigarettes per day or 2 shishas per day had pre-polycythemic and polycythemic hemoglobin levels [9]. We did not find any correlation between the intensity of hookah smoking and degree of erythrocytosis in our study. As hookah smoking is not considered a traditional form of smoking, patients can often neglect this information when asked about their smoking history. It is essential to elicit a detailed recreational history in the evaluation of unexplained erythrocytosis, especially in a young patient. Larger studies to substantiate the diverse ill-effects of hookah smoking are the need of the hour.

Learning points:

- By publishing this data, we would like to bust the myth that hookah smoking is an innocuous activity.
- We would like to create awareness among physicians to be wary of hookah smoking as a possible cause of secondary erythrocytosis, especially among young patients.
- Our article will strengthen the existing literature on harmful effects of hookah smoking so as to help develop regulatory scrutiny over its use.

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