

Screening Microbial Contamination of Smoking Waterpipe (Narghile) in Erbil city/ Iraq

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Abstract

Tobacco smoking, which is a traditional habit is a major health risk worldwide. However waterpipe (Narghile) smoking is an emerging smoking type, specifically among Erbil/ Iraq. In the recent years, smoking of Shisha (Narghile) has spread amongst adolescents and young adults in Erbil city. The aims of this study are to examine the prevalence of shisha pipe smoking in Erbil city and to determine the microbial pathogen contaminants present in these Shisha pipes. In this study, we performed a qualitative and quantitative analysis of the microbial contamination of (90) Shisha hose samples in Erbil. Eighteen samples were selected from each cafe and swabs were cultured and identified. Results showed that most Narghile users 82.2 % were male and half of them (50%) were in the age group of 20-30 years followed by the age group of 30-40 years. Data showed that 54% of the samples were contaminated, from them most microbial pathogens were G+ve bacteria. *Staphylococcus albus* and *Staphylococcus aureus* were among the most isolated pathogens, however *E. coli* was the most common G-ve bacteria in this study. On the other hand the number of fungi and yeasts identified in this study were 7 isolates, among them *Monilia*, *Paecillomyces spp* and *Aspergillus niger* were most common isolates. In conclusion, data produced from this study showed that Narghile users are exposed to many infectious microbial agents, because many users are unaware of the associated microbial contaminations and smoke narghile as a safe alternative to cigarette smoking. More research, should focus on strategies on how to avoid shisha smoking as the impact of its use is expected to affect the health and life of many people in our local community.

Key Words: Smoking, Shisha, Pathogens, Fungi, Erbil, Iraq.

تحريّ التلوث الجرثومي لأنبوب الماء للشيشة (ناركيلة) في مدينة أربيل/ العراق

الخلاصة

إنّ تدخين التبغ عادة تقليدية وخطر صحي كبير في جميع أنحاء العالم. مع ذلك فإنّ الشيشة (الناركيلة) هي نوع من أنواع التدخين الناشئة تحديداً في مدينة أربيل/ العراق، حيث انتشرت الظاهرة في السنوات الأخيرة بين المراهقين والشباب في مدينة أربيل. تهدف هذه الدراسة إلى معرفة مدى انتشار تدخين الشيشة في مدينة أربيل وتحديد التلوث الميكروبي الموجود في أنابيب الشيشة. أجرينا - في هذه الدراسة - تحليلاً نوعياً وكمياً للتلوث الجرثومي ل (٩٠) عينة خرطوم الشيشة. وتم اختيار ثمانية عشر عينة من كل مقهى ، وتم زرع المسحات وتشخيصها . أظهرت النتائج أن معظم مستخدمي الناركيلة كانوا ٨٢.٢٠٪ ذكور ونصفهم (٥٠٪) كانوا من الفئة العمرية ٢٠-٣٠ سنة، تلتها المجموعة العمرية ٣٠-٤٠ سنة. كما أظهرت البيانات أن ٥٤٪ من العينات كانت ملوثة ، حيث شكلت بكتيريا المجبة لصبغة كرام معظم المسببات الجرثومية، و أكثر العزلات هي البكتيريا العنقودية والمكورات العنقودية الذهبية ، إلا أن *E. coli* كانت أكثر البكتيريا السالبة لصبغة كرام الشائعة في هذه الدراسة. ومن ناحية أخرى كان عدد الفطريات والخمائر المحددة في هذه الدراسة ٧ عزلات ، من بينها *Monilia, Paecilomyces spp and Aspergillus niger* ، كانت الأكثر شيوعاً. في الختام ، أظهرت البيانات التي تم الحصول عليها من هذه الدراسة أن مستخدمي الناركيلة يتعرضون للعديد من العوامل الجرثومية المعدية، لأن العديد من المستخدمين لا يدركون التلوث الجرثومي المرتبط بها ويدخنون النرجيلة كبديل آمن لتدخين السجائر. يجب أن يركز المزيد من الأبحاث على استراتيجيات كيفية تجنب تدخين الشيشة، حيث من المتوقع أن يؤدي تأثير استخدامه على صحة العديد من الأشخاص وحياتهم في مجتمعنا المحلي.

الكلمات المفتاحية: التدخين، الشيشة، المرصات، الفطريات، أربيل، العراق .

Introduction

Tobacco smoking is a major health risk and traditional habit in the most area of the world. However, waterpipe (Narghile) smoking is an emerging smoking type, specifically in Erbil/ Iraq. There are several different names used in press for Narghile smoking such as waterpipes, shisha and more recent used devices called hookahs or argeela [1]. This type of smoking has been used in some parts of the world for more than 400 years. Waterpipe smoking notably increased among youth in recent years [2]. One of the reason behind the increased Narghile smoking is may be lack of knowledge on the side effects or negative effects of them contributed to the increase in use, another reason may be the attractive flavours used in the production of these type of tobacco [3 and 4].

As the internal part of shisha pipes provide an optimum warm condition for microbial growth, this may contribute to cause infections leading to respiratory infectious disease. There are a number of pathogens cause contamination of different parts of shisha pipes, among these bacteria *Staphylococci, Streptococcus spp, Neisseria spp and E. coli* [5]. The Shisha pipes normally shared by many people one after the other which may lead to spread of infection from one person to another. Narghile smoking has deleterious effects on the oral cavity, teeth, respiratory system and cardiovascular system. Long-term water pipe smokers have higher incidences of chronic obstructive pulmonary disease and periodontal diseases [6].

The aims of this study are to determine the microbial pathogenic contaminants present in Shisha pipes in several cafes in Erbil city/ Iraq and finding the main relevant information on some factors related to shisha users.

Material and Methods

The study design was a cross-sectional study and was conducted during August to December 2017. A sample size was calculated by EpiInfo. A sample of 90 waterpipes was chosen from an estimated total of 2,000 waterpipes, based on ± 6 precision with an estimated contamination rate of 89% and a 95% confidence interval. Erbil city was divided into five geographical zones (central, south, north, west and east). In each zone, the cafes were enlisted and one cafe was randomly selected. Eighteen waterpipes in each selected cafe were selected and tested.

The end part of the Shisha pipe about several centimetres from the body was used for swabs. This project was approved at the first site by the Scientific and Research Ethics Committee at College of Health Sciences/ Hawler Medical University. All swabs then were inoculated on blood agar and MacConkey agar for gram positive and gram negative bacteria, respectively. Saburate agar media was used for fungi isolation. Then plates for bacterial growth were incubated at 37° C for 24-48 h and Saburate agar plates incubated at 25° C for 2-5 days. After incubation bacterial colonies were selected according to variation in morphological characteristics (size, shape, colour, and margins). The selected bacterial colonies were transferred into fresh nutrient agar media to insure purity of isolates. The isolates were then identified using VITEK2 automated system according to the manufactures instructions. The fungal isolates were then transferred to sterilize plates for purification and identification depending on methods used by other researchers [7], grown fungi were mounted on a slide. Lactophenol-cotton blue was used to stain and detect fungal structures, covered with a cover slip. The slides were then examined for identification on the basis of their colony morphology and spore characteristics under microscope [8]. This project was approved at the first site by the Scientific and Research Ethics Committee at College of Health Sciences/ Hawler Medical University.

Results:

In the present study, most of shisha users were found to be male 74 (82.2%) and 16 (17.8%) female as shown in figure (1) and according to the age group half of shisha users 45 (50%) were in the age group of 20-30 and 24 (26.6%) were in the age group of 30-40 and 21 (23.4%) were in the age group of 40-50 as shown in figure (2).

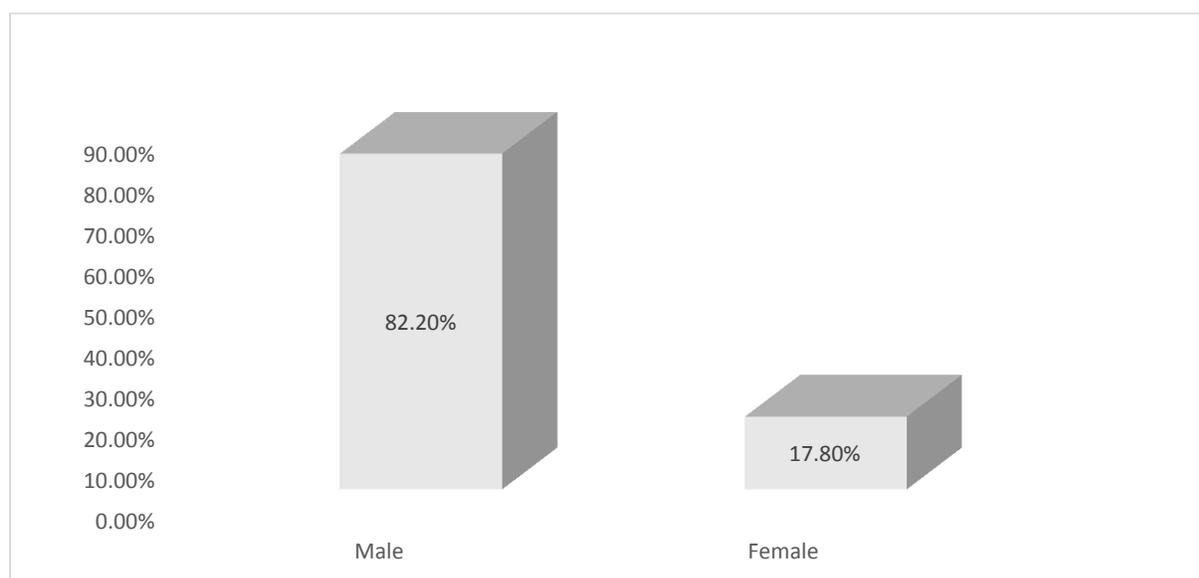


Figure (1) Bar chart representing the percentage of shisha smokers according to sex

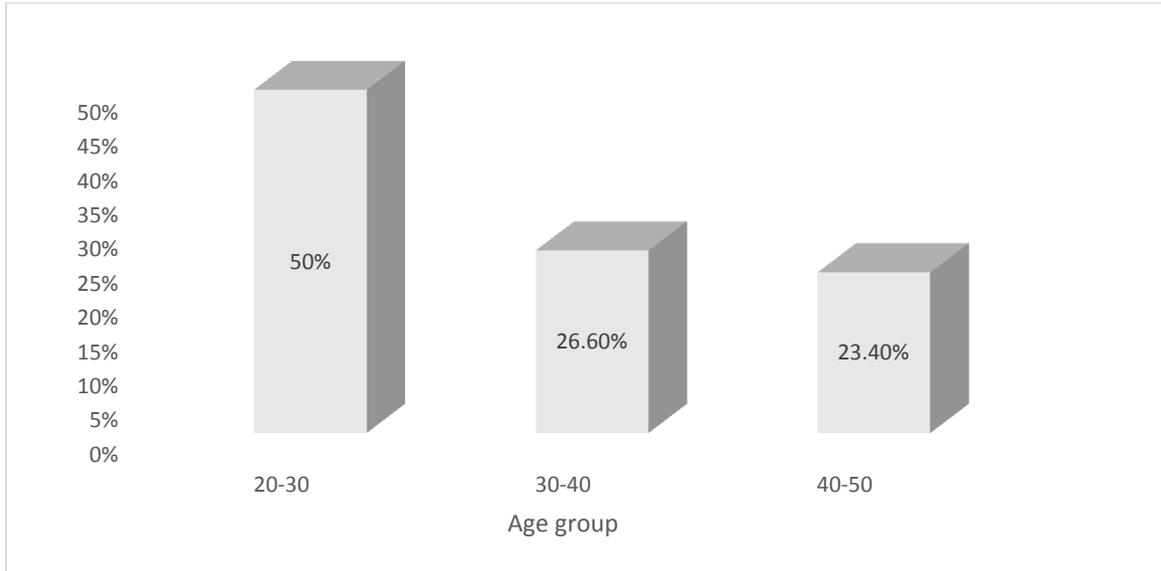


Figure (2) Bar chart representing the percentages of shisha smokers according to their age groups.

Regarding marital status, most shisha smokers in this study were found to be single 66 (73%) and only 24 (27%) were married as shown in figure (3)

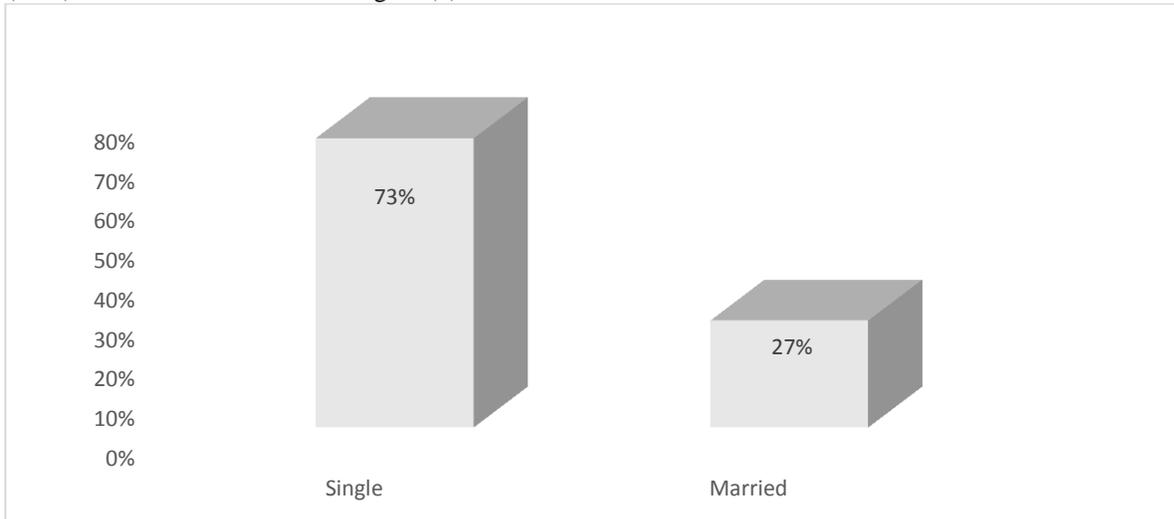


Figure (3) Bar chart representing the percentage of shisha smokers according to their marital status.

The demographics of those shisha smokers show that according to education levels 33 (37%) shisha smokers in low education levels (had only primary school completed) and 57 (63%) were with higher educations and have upper secondary levels and above.

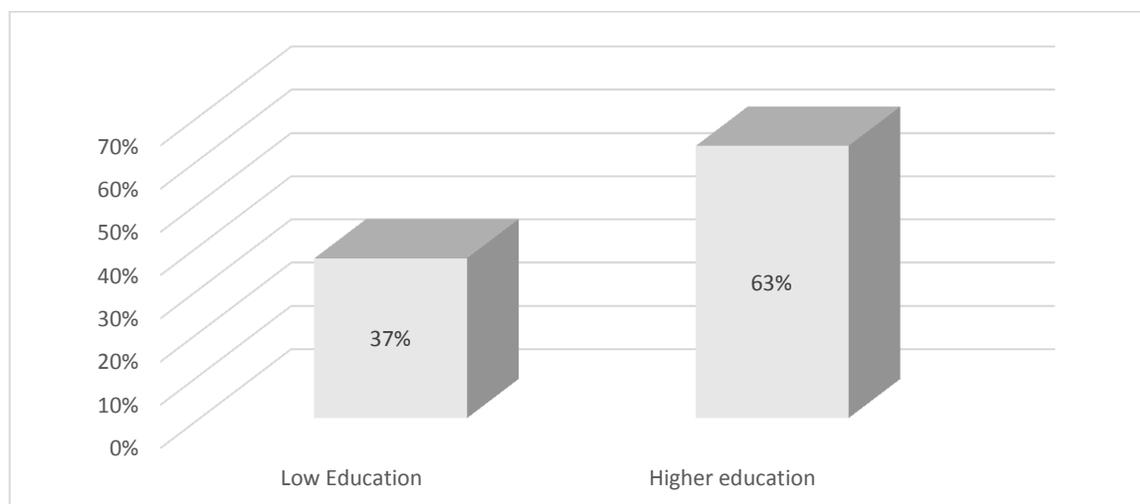


Figure (4) Bar chart representing of the percentage of shisha smokers according to education levels.

The results of the present study indicated that from a total of 90 samples 49 (54%) swab samples were contaminated and 41 (46%) were not contaminated (Table 1).

Table (1) Numbers and percentages of contaminated and non-contaminated swab samples

| Swab Sample | Number | % |
|--------------------------------|--------|-----|
| Contaminated swab samples | 49 | 54 |
| Non contamination swab samples | 41 | 46 |
| Total | 90 | 100 |

Our data showed that from 56 microbial pathogens isolated from 49 contaminated swabs, 32 (57%) were gram-positive bacteria and 17(30%) were gram-negative with 7 (13%) fungi and yeasts isolates as shown in Table (2). Total of 49 microbial isolates belonging to 10 different species were identified as waterpipe contaminants. 32 isolates 57% of the total isolates are comprised of 3 different species of Gram-positive bacteria, while 17 isolates 30% of the total isolates are comprised of 5 different species Gram-negative bacteria.

Table (2) Numbers and percentages of isolates according to types of microorganisms

| Microorganisms | Number | % |
|------------------------|--------|-----|
| Gram positive bacteria | 32 | 57 |
| Gram negative bacteria | 17 | 30 |
| Fungi and yeasts | 7 | 13 |
| Total | 56 | 100 |

From those gram-positive bacteria isolates, 18 (56.3%) were identified as *Staphylococcus albus*, 13 (40.6) were *Staphylococcus aureus* and 1(3.1%) were *Kocuria variance*. While most of the gram-negative isolates were *E. coli* 13 (76.5). Other gram-negative bacteria were identified such as *Pastuerella canis* and *Sphingomonas paucimobilis* which were 1 (5.9) and *Pseudomonas aeruginosa* were 2 (11.7). Other microbes were found such as fungi and yeasts, which were 7 isolates, and 2 (28.6) yeast each of *Monilia* and *Paecillomycet spp* were 1 (14.3) while *Aspergillus niger* was 3 (42.8) as shown in Table (3). The most frequently isolated organisms were *Staphylococcus albus* (18 isolates) followed by *Staphylococcus aureus* and *E. coli* (13 isolates each).

Table (3) Numbers and percentages of types of microorganisms

| Gram+ve | Number (%) | Gram-ve | Number (%) | Fungi and yeasts | Number (%) |
|------------------------------|------------|----------------------------------|------------|---------------------------|------------|
| <i>Staphylococcus albus</i> | 18 (56.3) | <i>E. coli</i> | 13 (76.5) | Yeast | 2 (28.6) |
| <i>Staphylococcus aureus</i> | 13 (40.6) | <i>Pastuerella canis</i> | 1 (5.9) | <i>Monilia</i> | 1 (14.3) |
| <i>Kocuria variance</i> | 1 (3.1) | <i>Sphingomonas paucimobilis</i> | 1 (5.9) | <i>Paecillomycet spp.</i> | 1 (14.3) |
| | | <i>Pseudomonas aeruginosa</i> | 2 (11.7) | <i>Aspergillus niger</i> | 3 (42.8) |
| | 32 (100) | | 17 (100) | | 7 (100) |

Discussion

Although Narghile smoking is a very old habit among people in Middle East, it has only recently become a popular behaviour among Kurdish youth in Erbil city. The present study found some negative health consequences of the Narghile smoking. Several disease related to this habit have been reported, Pulmonary aspergillosis in a leukemia patient was reported as a result of smoking contaminated tobacco and marijuana in a water pipe [9]. Transmission of tuberculosis was also seen in some people sharing a marijuana water pipe [10]. Data from some new researches showed that smoking Narghile is a fast growing habit among young people, in particular university students [11]. Our data showed that 50% of the shisha users were in the age group of 20-30 years, close to result data performed in Bahrain on male secondary school student shows that the ratio of the first year student smoking was 26.6% and second year was 25.5% and third year student was 25.4% [12].

The data produced from this study showed that most 82.20 % of the users were male, different from results of a study among Israeli Arab high school students shows that from 326 adolescents 55.0% were boys and 17.4% were girls [13]. Search shows that every 4 male students of (KSU) and the major factor is the friends that convince for smoking [14]. In Cambodia, the prevalence of tobacco pipe use among ethnic minorities living on the Lao-Cambodia border exceeded 30% in men and 48% in women [15]. More researches on gender difference in shisha users, in Syria it was evaluated that 62.6% male and 29.8% female university students were regular smokers of Shisha [16]. Studies in three colleges of Saudi Arabia indicate that prevalence of shisha users was 12.6% [17]. Another study in Beirut evaluated that 60% adolescents of age 13–20 years had smoked shisha [18]. In Lebanon the youth tobacco user in 2005 was 13-15 years old [19]. While in a university in Malaysia the prevalence of Shisha smokers was 20% [20]. Another result in San Diego university shows that the prevalence of shisha smoking to be 24.5% [21]. The introduction of mass communication ways and the lack of regulatory/policy specific to this smoking habit played an important role in spreading of shisha smoking among people [15 and 22].

Our data showed that 57% of the contaminated pathogens were G+ve bacteria and 30% were among G-ve bacteria. From G+ve bacteria, *Staphylococcus albus* and *Staphylococcus aureus* were dominant. Among G-ve pathogens, *E. coli* were the most isolated one. Similarly, other studies showed that of 285 samples from different parts of the waterpipes, 236 (82.8%) showed positive cultures, Coagulase-negative staphylococci (32.9%), *Streptococcus* spp (26.9%), *Neisseria* spp (13.7%) and *Escherichia coli* (9.4%) were the most frequent contaminants [5]. Other bacterial species were isolated from other studies, such as *Bacillus*, *Micrococcus*, *Corynebacterium*, *Streptococcus pneumonia*, *Neisseria meningitides*, *Haemophilus influenza* [3 and 23]. Sharing and use of waterpipes may be transmit bacterial and viral pathogens through droplet, airborne, fomite and fecal-oral routes of transmission [10]. Fungal growth was also noted in this study 13% were fungi and yeasts such as *Monilia*, *Paecilomyces* spp., and *Aspergillus niger*, others were found different species of fungi includes *Aspergillus fumigatus*, *Penicillium marneffe*, *Fusarium proliferatum* [10]. The high prevalence of sharing behaviors among waterpipe smokers in rural Southeast Asia raises the possibility that this behavior provides important and unmeasured social network pathways for the transmission of infectious agents. Educators and health care professionals should serve as good role models and be active in the process of appropriate legislative efforts to limit the use of shisha [24].

In conclusion, our showed that Narghile users are exposed to many infectious microbial agents, because many users are unaware of the associated microbial contaminations and smoke narghile as a safe alternative to cigarette smoking. Similar work can be applied on different geographical areas. The health care professionals should use active mechanisms to educate our community about the danger of sharing shisha among them and they should be meticulously cleaned to prevent transmission of disease. The media should be used to convey the message that smoking shisha is at least as dangerous as smoking cigarettes. As it is not acceptable to sell alcoholic beverages and cigarettes to minors, providing opportunities for minors to smoke shisha should also be outlawed. Parents should also be involve in

explaining the harmful consequences of smoking a shisha on their children. Furthermore, more research, as well as Public health authorities should focus on strategies how to make our community refrain from shisha smoking as the impact of its use is expected to affect the health and life of many.

References

- [1] Aljarrah K, Ababneh Z, Al-Delaimy W. (2009) Perceptions of hookah smoking harmfulness: predictors and characteristics among current hookah users. *Tobacco Induced Disease*; 5 (16): 1–7.
- [2] Barry Knishkowsy, MD, MPH, and Yona Amitai, MD, MPH (2005) Water-Pipe (Narghile) Smoking: An Emerging Health Risk Behavior; *Pediatrics* Vol. 116 No.1. 113-119.
- [3] Masadeh MM, Hussein EI, Alzoubi KH, Khabour O, Skakhatreh MA, Gharaibeh M. (2015) Identification, characterization and antibiotic resistance of bacterial isolates obtained from waterpipe device hoses. *International Journal of Environment Research Public Health*; 12 (5): 5108–5115.
- [4] Rastam S, Ward KD, Eissenberg T, Maziak W. (2004). Estimating the beginning of the waterpipe epidemic in Syria. *BMC Public Health*; 4:32.
- [5] Safizadeh H., Moradi M., Rad MR and Nakhaee N.(2014) Bacterial contamination of different components of the waterpipe. *International Journal Tuberculosis Lung Disease*. Aug; 18 (8): 988-991.
- [6] WHO (2005) *Waterpipe Tobacco Smoking: Health Effects, Research Needs and Recommended Actions by Regulators*, WHO Study Group on Tobacco Product Regulation (TobReg), World Health Organisation 2005.
- [7] Basu, P.K. (1980). Production of chlamydospores of *phytophthora megasperma* and their possible role in primary infection and survival in soil. *Can. Journal of Plant Pathology*, 2: 70-75.
- [8] Rajankar, P.N., D.H. Tambekar and S.R. Wate (2007). Study of phosphate solubilization efficiencies of fungi and bacteria isolated from saline belt of purna river basin. *Research Journal of Agriculture Biological Sciences*, 3(6): 701-703.
- [9] Szyper-Kravitz M, Lang R, Manor Y, Lahav M. (2001). Early invasive pulmonary aspergillosis in a leukemia patient linked to *Aspergillus* contaminated marijuana smoking. *Leukemia Lymphoma*; 42: 1433–1437
- [10] Munckhof WJ, Konstantinos A, Wamsley M, Mortlock M, Gilpin C. A (2003). Cluster of tuberculosis associated with use of marijuana water pipe. *International Journal Tuberculosis Lung Disease*; 7: 860 – 865.

- [11] Daniel Jackson and Paul Aveyard (2008) Waterpipe smoking in students: Prevalence, risk factors, symptoms of addiction, and smoke intake. Evidence from one British university.
- [12] Al-Haddad, N., & Hamadeh, R. (2003). Smoking among secondary-school boys in Bahrain: prevalence and risk factors. *Eastern Mediterranean Health Journal*, 9(1/2)
- [13] Korn, L. and Racheli Magnezi (2008). Cigarette and Nargila (Water Pipe) Use Among Israeli Arab High School Students: Prevalence and Determinants of Tobacco Smoking. *The Scientific World Journal*; 8, 517-525.
- [14] Al-Swuailem, A., AlShehri, m., & Al-Sadhan, S. (2014). Smoking among dental students at King Saud University: Consumption patterns and risk factors. *The Saudi Dental Journal*, 88-95.
- [15] Singh, P.; Yel, D.; Sin, S.; Khieng, S.; Lopez, J.; Job, J.; Ferrye, L.; Knutsen, S. (2009) Tobacco use among adults in Cambodia: Evidence for a tobacco epidemic among women. *Bull. World Health Organization*, 87, 905–912.
- [16] Maziak W, Fouad FM, Asfar T, Hammal F, Bachir EM, Rastam S, Eissenberg T, Ward KD. (2004). Prevalence and characteristics of narghile smoking among university students in Syria. *International Journal Tuberculosis Lung Disease*; 8 (7): 882–889
- [17] Taha AZ, Sabra AA, Al-Mustafa ZZ, Al-Awami HR, Al-Khalaf MA, Al-Momen MM. (2010). Water pipe (shisha) smoking among male students of medical colleges in the eastern region of Saudi Arabia. *Annals of Saudi Medicine*; 30 (3): 222–226.
- [18] Afifi RA, Yeretzian JS, Rouhana A, Nehlawi MT, Mack A. (2010). Neighbourhood influences on narghile smoking among youth in Beirut. *European Journal of Public Health*; 20 (4): 456–462.
- [19] Nakkash RT, Khalil J, Afifi RA. (2011). The rise in narghile (shisha, hookah) waterpipe tobacco smoking: a qualitative study of perceptions of smokers and non-smokers. *BMC Public Health*; 11:315.
- [20] Al-Naggar RA, Bobryshev YV. (2012). Shisha smoking and associated factors among medical students in Malaysia. *Asian Pacific Journal of Cancer Prevention*; 13 (11): 5627–5632.
- [21] Smith JR, Edland SD, Novotny TE, Hofstetter CR, White MM, Lindsay SP, Al-Delaimy WK. (2011). Increasing hookah use in California. *American Journal Public Health*. 2011; 101 (10): 1876–1879.

- [22] Singh S.K. L. Enzhong D.D. Reidpath and P. Allotey (2016). Shisha (waterpipe) smoking initiation among youth in Malaysia and global perspective: A scoping review (2006–2015) Volume 144, Pages 78–85.
- [23] Bagaitkar, J.; Demuth, D.; Scott, D. (2008). Tobacco use increases susceptibility to bacterial infection. Tobacco Induced Disease; 4, 12.
- [24] Urkin j. Rivka Ochaion², and Aya Peleg¹ (2006) Hubble Bubble Equals Trouble: The Hazards of Water Pipe Smoking. The Scientific World Journal; 6, 1990–1997.
- [25] Martin R. Sahar D. Safaee , Khamphithoun S., Boualoy M., Ryan S., Shweta B. and Pramil N. Singh (2013). Mixed Methods Pilot Study of Sharing Behaviors among Waterpipe Smokers of Rural Lao PDR: Implications for Infectious Disease Transmission International Journal of Environment Research Public Health ; 10, 2120-2132.
- [26] Verweij, P.E.; Kerremans, J.J.; Voss, A.; Meis, J.F. (200). Fungal contamination of tobacco and marijuana. JAMA, 284, 2875.