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ISOLATION OF POTENTIAL PATHOGENS FROM USED AND SHARED CIGARETTES: A PUBLIC HEALTH CONCERN

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ABSTRACT: Exposure to tobacco products and ever increasing craze of cigarette smoking in youth are the prime causes of mortalities as reported in different hospitals including cancer treatment centers. Youth behavior is deeply influenced by the neighborhood community, exposure to media and unreported marketing chain for respective products. Behavioral aspects of youth at public places have been well summarized by eminent psychologists. Sharing cigarettes at public places is one of the blindly followed behavioral aspects in youth. Present paper highlights the potential transmission of pathogens by shared cigarettes. The research revealed the presence of *Salmonella typhi, Lactobacillus paraplantarum, Acinetobacter indicus,* and *Bacillus flexus.* These findings raise significant concerns about public health implications and highlight the critical need for increased awareness regarding hygiene practices among smokers.

Keywords: Tobacco, Cigarettes, MALDI-TOF, Smoking, Respiratory diseases.

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1. INTRODUCTION

Despite of prohibitory statutory advertisement the total sale of cigarettes in India is 20%. Global figure for the same is 20%. Entire research related to tobacco products is focused on carcinogenic effects and less literature is available for their role as a potential vehicle for transmission of diseases. Adverse effects of tobacco are well documented. In 1980 figure for cigarette users was 4.96 trillion

and by the end of 2025 it is predicted as 9 trillion [5]. Cause of diseases including cancer, cardiovascular diseases, respiratory diseases are directly or indirectly related to smoking habitats [11]. Oral micro flora of human beings is governed by health status, presence or absence of infectious diseases, work culture and it includes beneficial or harmful bacteria [4]. Al-Ahmad et.al. 2006, Pauly, J. L et al. 2001, have emphasized potential health hazards following smoking habitats [9,1]. Nevertheless, little is known about the precise pathogenic potential of the microbial populations present on shared and used cigarettes. By separating and identifying possible bacterial pathogens from shared and used cigarettes, this study seeks to close this knowledge gap and advance our understanding of the possible public health hazards connected to this behavior.

2. MATERIALS AND METHODS

Cigarette samples were collected from individuals sharing cigarettes during smoking. Collected samples were aseptically inoculated into sterile nutrient broth and incubated at 37°C for 30 minutes to allow bacterial detachment. Following enrichment, serial dilutions were performed on the broth, culminating in a 10^4 dilution. 0.1 ml of this final dilution was spread onto sterile 'Muller Hinton Agar' (MHA) plates, followed by incubation at 37°C for 48-72 hours. Individual colonies exhibiting distinct morphologies were selected and sub cultured onto fresh MHA plates. The isolates were characterized using morphological observations and biochemical tests, and final identification was achieved using MALDI-TOF technique.

3. RESULTS AND DISCUSSION

Salmonella typhi, Lactobacillus paraplantarum, Acinetobacter indicus and *Bacillus flexus* were isolated and identified using MALDI-TOF technique. While numerous studies have explored the chemical composition, heavy metal content, and other abiotic factors in cigarettes and their association with lung cancer and respiratory diseases, limited research has investigated the bacterial diversity present in cigarettes and its potential impact on respiratory health among smokers and those exposed to secondhand smoke. Notably, Sapkota et al. (2009) conducted a study on cigarettes obtained from five randomly selected tobacco stores in Lyon, France, analyzing four popular cigarette brands: Marlboro Red (Philip Morris, Inc., USA), Camel (R.J. Reynolds Tobacco Co., USA), Kool Filter Kings and Lucky Strike Original Red (British American Tobacco Group, UK). Their findings revealed the consistent presence (≥90% of samples) of several bacterial genera, including *Acinetobacter*, *Bacillus*, *Burkholderia*, *Clostridium*, *Klebsiella*, *Pseudomonas aeruginosa*, and *Serratia*. Additionally, other potential pathogens such as *Campylobacter, Enterococcus, Proteus*, and *Staphylococcus* were also detected. In the present study, *Acinetobacter indicus* and *Bacillus flexus* were isolated from used and shared cigarette samples and identified using MALDI-TOF mass spectrometry. The presence of these bacteria, particularly in shared cigarettes, suggests a potential risk of microbial transmission and respiratory infections among users. Colman et al. (1976) reported a decrease in *Neisseria* species on the mucosal surfaces of smokers and an increased ratio of Gram-

positive to Gram-negative bacteria in dental plaques, indicating that smoking may alter oral microbiota. Supporting this, Heitmann et al. (2014) found significant shifts in the oral bacterial profile of smokers, with increased levels of *Streptococcus sobrinus* and *Eubacterium brachy* in saliva, and decreased abundance of *Neisseria*, *Porphyromonas*, and *Gemella* in oral wash samples. In our current investigation, *Lactobacillus paraplantarum* was isolated from cigarette samples, also identified using MALDI-TOF, further demonstrating the microbial diversity associated with tobacco products. *Lactobacillus plantarum*, a well-known species of lactic acid bacteria, is found in diverse environments including fermented foods (e.g., vegetables, dairy, and meat products) and the gastrointestinal tracts of humans and animals. While some species of *Lactobacillus* have been associated with health benefits, the context of their presence in cigarettes requires further exploration to understand their potential health implications. Additionally, the isolation of *Salmonella spp*. in used and shared cigarette samples in the present study is particularly concerning. *Salmonella* is known to cause a spectrum of illnesses, ranging from mild gastroenteritis to severe systemic infections, depending on host factors such as age, immune status, and the specific serovar involved. Castillo et al. (2011) demonstrated that administration of *Lactobacillus casei* CRL 431 in mice reduced the severity of infection caused by *Salmonella enterica serovar Typhimurium*, highlighting the potential of probiotics as preventive agents. However, the detection of *Salmonella* in cigarettes indicate a serious risk of transmission and infection, especially in scenarios involving shared usage. Overall, the findings of this study underscore the importance of examining microbial contamination in cigarettes, particularly those that are used and shared. The presence of potentially pathogenic microorganisms poses an additional, often overlooked, health risk associated with tobacco use. Further research is needed to assess the viability, pathogenicity, and health consequences of these microbes in smokers and individuals exposed to secondhand smoke.

4. CONCLUSION

This study provides compelling evidence that used and shared cigarettes can harbor a diverse array of potential pathogens, posing a notable public health risk. MALDI-TOF analysis identified the presence of *Acinetobacter indicus, Bacillus flexus, Lactobacillus paraplantarum,* and *Salmonella typhi*. These findings underscore the urgent need for public health interventions aimed at discouraging the practice of cigarette sharing and raising awareness about the associated infectious disease risks. Further research is necessary to evaluate the viability and virulence of these pathogens under conditions relevant to cigarette sharing and environmental exposure. Such investigations will be crucial in developing effective strategies to mitigate the potential health consequences linked to this behavior.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals or humans were used for the studies that are based on this research.

CONSENT FOR PUBLICATION

Not applicable.

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CONFLICT OF INTEREST

Authors do not claim for conflict of interest.

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