



A Comprehensive Review of Behavioural Risk Factors Associated with Communicable Diseases

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Abstract

Background: The COVID-19 pandemic has highlighted the vulnerability of individuals with modifiable behavioral risk factors, such as smoking, excessive alcohol consumption, obesity, and physical inactivity, to severe health outcomes. These risk factors, prevalent across both high-income and low- and middle-income countries, exacerbate health inequities, impacting the transmission and severity of communicable diseases.

Methods: This review synthesizes existing literature by searching online databases including bioRxiv, medRxiv, ChemRxiv, Google Scholar, and PubMed. It focuses on major communicable diseases, particularly influenza, respiratory infections, and sexually transmitted infections (STIs), analyzing the influence of behavioral risk factors on disease contraction and outcomes.

Results: The review identified significant associations between various behavioral risk factors and communicable diseases. Alcohol use was found to elevate the risk of tuberculosis (TB), HIV, and pneumonia. Similarly, illicit drug use, physical inactivity, and obesity were linked to increased susceptibility and severe outcomes from these diseases. Smoking and secondhand smoke exposure were also correlated with heightened risks of respiratory infections and TB.

Conclusion: Behavioral risk factors play a crucial role in determining the incidence and severity of communicable diseases. Addressing these factors is essential for effective prevention strategies, particularly in marginalized communities. The findings underscore the need for public health interventions targeting these modifiable behaviors to enhance resilience against both current and future infectious disease threats.

Keywords: communicable diseases, behavioral risk factors, COVID-19, public health, prevention strategies.

Received: 10 October 2023 **Revised:** 24 November 2023 **Accepted:** 08 December 2023

1. Introduction

The recent COVID-19 pandemic has underscored that individuals with modifiable behavioral risk factors linked to non-communicable diseases, such as smoking, excessive alcohol consumption, obesity, and physical inactivity, are more susceptible to severe COVID-19 symptoms, leading to an increased risk of hospitalization [1,2]. The frequency of these behavioral risk factors is generally greater in impoverished settings, resulting in COVID-19 disproportionately affecting those already facing significant health risks, thereby exacerbating health and socioeconomic inequities [3]. COVID-19 is characterized as a syndemic, since its connections with pre-existing health and social risk factors heighten an individual's vulnerability to the illness. Nevertheless, whereas the management of behavioral risk factors is well acknowledged in the prevention of non-communicable diseases, their influence on the transmission of communicable diseases and the severity of symptoms in infected individuals has received comparatively less attention in public health discourse [4,5].

Numerous modifiable behavioral risk factors are prominent among adults and adolescents in both high-income countries (HICs) and low- and middle-income countries (LMICs), with growing levels seen in many LMICs, such as obesity and alcohol use [6-8]. Consequently, non-communicable diseases (NCDs), including cancer, respiratory diseases, and cardiovascular diseases, are the leading causes of mortality and morbidity in high-income countries (HICs) and are increasingly contributing to these metrics in low- and middle-income countries (LMICs) [9]. The prevalence of non-communicable diseases (NCDs) worldwide has been seen to connect with the incidence of COVID-19 cases and fatalities.

Given that international business and tourism link people worldwide, it is probable that COVID-19 is but one among a succession of present and developing infectious illnesses that will affect global health and well-being to varying degrees [10,11]. While the precise form or origin of any forthcoming epidemic or pandemic danger remains uncertain, behavioral risk factors have been identified as contributing to an elevated risk of infection and subsequent adverse consequences across several infectious illnesses [12-14]. Comprehending the factors that may elevate or diminish the risk of contraction and severity of disease can yield critical insights, enhancing a population's resilience to infectious diseases and pinpointing communities and individuals most susceptible to the proliferation of various diseases. While prior research has examined the connections between behavioral risk factors and specific infectious illnesses, few studies have integrated data across a broader spectrum of communicable diseases and their associations with behavioral hazards. Such correlations may clarify how future pandemic threats would exploit behavioral risk factors.

This review aimed to investigate whether communicable diseases and non-communicable diseases (NCDs) share common behavioral risk factors by synthesizing existing research on the influence of these risk factors, typically linked to NCDs, on the likelihood of individuals (both adults and children) contracting or experiencing severe outcomes from prevalent communicable diseases. This review focused on communicable illnesses prevalent in high-income nations that need restriction. The review, with a broad emphasis on several communicable illnesses, particularly examined systematic reviews and meta-analyses, elucidating current understanding and identifying evidence gaps to guide future research priorities.

2. Methodology

The literature for this review was sourced by searching the following online databases: bioRxiv, medRxiv, ChemRxiv, Google Scholar, and PubMed.

3. Results

Research about the following communicable illnesses (including infections and pathogens) was identified: tuberculosis (TB), human immunodeficiency virus (HIV), hepatitis C virus (HCV), hepatitis B virus (HBV), invasive bacterial disease (IBD), pneumonia, influenza, and coronavirus disease 2019 (COVID-19).

Seventeen reviews identified alcohol as a risk factor for a communicable disease, employing various definitions: any alcohol consumption; any alcohol use or elevated amounts; binge drinking or alcohol misuse; alcohol misuse; alcohol use disorder (AUD); alcoholism; or current/history of excessive use [19-36]. The preponderance of reviews indicated an elevated risk of contraction and more severe outcomes. In all alcohol evaluations, computed effect sizes varied from 1.83 to 8.22 for contraction and from 1.45 to 2.47 for severe consequences. Alcohol use, whether in any quantity, excessive quantities, binge drinking, or alcohol use disorder (AUD), has been associated with an elevated risk of getting tuberculosis (TB) [18], human immunodeficiency virus (HIV), pneumonia, and invasive pneumococcal diseases (IPD) [20-23]. One study could not reach a conclusion but presented conflicting results regarding the relationship between alcohol use and the development of tuberculosis [19]. Alcohol use (including any use, misuse, history of excessive use, alcoholism, or AUD) has been associated with an elevated risk of experiencing more severe outcomes from tuberculosis (TB) [37-44], human immunodeficiency virus (HIV), and hepatitis C virus (HCV) [45-49]. One study indicated inconclusive findings regarding the relationship between alcohol use and tuberculosis outcomes, while another review presented inconsistent results among studies investigating the correlation between alcohol consumption and HIV progression [19,47].

4. Illicit substance consumption as a risk determinant

Fifteen reviews analyzed the correlation between illicit drug use and the contraction or outcomes of communicable diseases, employing a diverse array of definitions: drug abuse; illicit drug use; regular/problematic cocaine use; recent drug use; and injection drug use [19, 20, 24-29, 39, 41, 48, 50-53]. The bulk of evaluations indicated an elevated risk of contraction and more severe results. In all drug use evaluations, effect sizes, when computed (for more severe outcomes only), varied from 1.01 to 3.96. Injection drug use and illegal drug use have been associated with an elevated risk of developing tuberculosis (TB) [24] and human immunodeficiency virus (HIV), whereas the incidence of hepatitis C virus (HCV) is notably greater among persons who inject drugs (PWID) compared to the general population or community groups [20, 24-29]. One study could not reach a conclusion but presented conflicting results regarding the relationship between drug misuse and tuberculosis infection [19]. Injecting drug usage and drug use/abuse have been associated with an elevated risk of experiencing more severe outcomes from tuberculosis (TB), human immunodeficiency virus (HIV), and hepatitis C virus (HCV) [39, 41, 48, 50, 51]. Moreover, the prevalence of hepatitis D (HDV; co-infection with HDV is regarded as a more severe variant of viral hepatitis) was significantly elevated among people who inject drugs (PWID) in comparison to a mixed population without risk factors [52, 53]. One analysis showed inconclusive results regarding the correlation between substance abuse and tuberculosis outcomes, while another review determined that treatment outcomes for hepatitis C virus were comparable across those who were presently injecting drugs and those who were not [19, 52].

5. Physical inactivity as a risk factor

A systematic review was discovered that investigates the relationship between physical activity and the contraction or consequences of communicable diseases. This research indicated a correlation between extended moderate aerobic exercise and decreased influenza-related mortality, as well as enhanced immunocompetence [38].

6. Obesity as a risk factor

Ten evaluations examined the correlation between obesity, or overweight and obesity, and the risk of communicable diseases [30-32, 54-60]. Obesity has been associated with an increased risk of acquiring influenza and pneumonia [30- 32]. Obesity has been associated with an elevated risk of experiencing more severe consequences from influenza and COVID-19 [30, 54-56, 58-60]. A study determined that the majority of research indicated a correlation between elevated body mass index (BMI) and a more severe

clinical manifestation of COVID-19, as well as an increased need for hospitalization. This study indicated that obesity seemed to forecast worse clinical outcomes in COVID-19 patients; however, the research included exhibited inadequate methodological rigor [57]. One research revealed that obesity heightened the risk of pneumonia but also indicated that obese patients had a reduced mortality risk from the condition [32].

Smoking has been associated with an increased risk of acquiring HIV, pneumonia, and invasive pneumococcal disease (IPD) [23]. Additionally, smoking has been shown to elevate the likelihood of experiencing more severe results from tuberculosis, influenza, and COVID-19 [19, 20, 23, 41-43, 56, 61-68]. Two evaluations indicated no correlation between smoking and exacerbated outcomes from communicable illnesses, including mortality from tuberculosis and tuberculosis treatment results. One evaluation indicated that active smoking may increase the incidence of severe COVID-19, however, the outcome was significantly affected by a single research [67].

One study indicated that exposure to second-hand smoke heightened the risk of tuberculosis infection and illness [34]. The last four evaluations indicated evidence that second-hand smoke exposure elevates the chance of acquiring communicable diseases, including tuberculosis [35, 36], pneumonia (particularly in those aged 65 and older) [33], and invasive meningococcal disease [IMD] [37]. Exposure to second-hand smoke has been associated with an elevated risk of poor outcomes from acute lower respiratory infections (ALRIs), such as pneumonia [69].

Only two studies were found that investigated the relationship between poor nutrition and communicable illness outcomes, and no reviews were discovered that explored the correlation between poor diet and the transmission of communicable diseases. A review indicated that vitamin D levels may affect the progression of HIV illness [70]. The second review indicated that higher consumption of polyunsaturated fatty acids correlated with non-responsiveness to HCV antiviral treatment [49].

7. Discussion

This comprehensive study reveals that behavioral risk factors significantly influence the likelihood of developing and experiencing more severe consequences from common communicable illnesses. To the authors' knowledge, this is the first review that consolidates research examining the influence of behavioral risk factors on several communicable illnesses. Although the emphasis on specific communicable illnesses and the use of systematic reviews have resulted in unavoidable gaps, the results still provide compelling evidence that both non-communicable diseases and communicable diseases possess a shared array of behavioral risk factors. This study suggests that the prevention of communicable diseases is most effective when it addresses behavioral risk factors. These results are pertinent, considering the COVID-19 pandemic, and underscore the potential advantages of mitigating behavioral risk factors in anticipation of future epidemics or pandemics. The precise disorders implicated may only be conjectured, although they are likely to exhibit certain traits similar to those discussed in this article.

This review has not analyzed the processes linking behavioral risk factors to communicable illnesses, however various pathways are likely to exist. Behavioral variables, including alcohol use, tobacco use, obesity, and illegal drug use, are well-documented to compromise the immune system. Smoking is recognized to affect both innate and adaptive immunity [71]. Immunological impairments may increase susceptibility to infectious illnesses and diminish the capacity to manage or recuperate from infections, resulting in worse outcomes [72-74]. The use of alcohol and drugs may diminish the effectiveness of therapy for communicable illnesses. The existence of comorbidities, including diabetes and cardiovascular disease, among patients with behavioral risk factors has been associated with an elevated risk of communicable illnesses [75].

Nonetheless, behavioral risk factors, including obesity, are shown to independently affect communicable illnesses, even after controlling for comorbidities [55]. Behavioral processes may be significant, especially for alcohol and drug use, which might diminish risk perception, obstruct service use, or result in inadequate treatment adherence [76]. Moreover, behavioral risk factors may often co-occur, such as the

simultaneous use of alcohol and tobacco, hence exacerbating the impact on communicable illnesses. Moreover, behaviors linked to drug use, such as intravenous drug administration, have a high efficacy in the transmission and reinfection of infectious illnesses [77]. The presence of a communicable illness may also result in behavioral risk factors, such as the use of alcohol to cope with the emotional pain associated with diseases like HIV and HCV. Ultimately, social mechanisms, such as the marginalization of heavy drinkers, may influence health service utilization or treatment, alongside social issues like homelessness, incarceration, and poverty, which could heighten the risk of both behavioral risk factors and communicable diseases. Multiple mechanisms presumably exist through which various physiological, behavioral, and social variables interact to influence the transmission probability and severity of infectious diseases, necessitating more exploration.

Behavioral risk factors affect the incidence and severity of communicable illnesses; hence, their avoidance may contribute to mitigating future communicable disease burdens, presumably by enhancing immune function, overall physiological performance, and risk-related behaviors. The recent COVID-19 pandemic has underscored that prevention measures may also influence the burden of communicable diseases by potentially decreasing non-communicable diseases linked to behavioral risk factors, which can modify immune system function and elevate the risk of complications and mortality from communicable diseases. The review results are crucial for comprehending the danger of infectious diseases and are pertinent considering the COVID-19 pandemic. They propose that enhancing the avoidance of behavioral risk factors might mitigate the adverse effects of future epidemics or pandemics, fostering resilience and addressing the urgent need for increased investment in pandemic preparation [78]. COVID-19 serves as a reminder that effective communicable disease management is essential; moreover, addressing behavioral risk factors successfully will enhance our capacity to mitigate the burden of communicable diseases, including potential future epidemics or pandemics. The discovery that both communicable illnesses and non-communicable diseases have a shared array of behavioral risk factors reinforces a more comprehensive knowledge of these two types of disease. Research indicates that non-communicable diseases (NCDs) and communicable diseases can interact; NCDs may elevate the risk and severity of communicable diseases (e.g., individuals with diabetes, hypertension, and respiratory conditions are more susceptible to COVID-19), while certain diseases formerly classified as NCDs are now recognized to have an infectious etiology (e.g., hepatitis B virus is a causative agent of hepatocellular carcinoma).

This research primarily addresses high-income countries (HICs), although its results are pertinent to low- and middle-income countries (LMICs), which often endure a much greater burden of communicable diseases and are seeing an escalation in the frequency of behavioral risk factors in several nations. Countries are confronting a swiftly escalating burden of non-communicable diseases (NCDs) due to aging populations, adverse effects of globalization, and inadequately prepared health systems, which may diminish resistance to infections, exacerbate complications of communicable diseases, or hinder their treatment. The adverse impact of increasing behavioral risk factors and associated non-communicable diseases on the spread of communicable diseases might influence not just low- and middle-income countries but also global health and well-being.

Behavioral risk factors and associated non-communicable diseases (NCDs) are prevalent among disadvantaged people in both high-income countries (HICs) and low- and middle-income countries (LMICs), with poverty exacerbating these risk factors and diseases, and vice versa. Disadvantaged groups are thus more prone to endure the twin costs of non-communicable diseases and communicable diseases, exacerbating social and economic health disparities. In the UK, individuals residing in the most impoverished localities have been more than twice as likely to succumb to COVID-19 compared to those in the least disadvantaged regions [79]. Mitigating behavioral risk factors, especially among marginalized communities, is expected to significantly contribute to diminishing future global and national health disparities, along with the disproportionate impact of forthcoming pandemics.

This work has several restrictions. The extensive scope of the study enabled a comprehensive examination of the connections between behavioral risk factors and communicable illnesses. Nonetheless, this precluded the investigation of causal pathways for particular correlations. Additional study on these

pathways would enhance comprehension and guide preventative efforts. The reliance on systematic reviews to obtain comprehensive information may have resulted in the exclusion of recent empirical studies, as only extensively researched topics with sufficient data for systematic review were incorporated, thereby omitting detailed insights such as potential interactions among risk factors. The absence of universally accepted definitions of behavioral risk factors in the literature precluded the standardization of these definitions in this review, resulting in considerable variation within each risk factor category and impeding the discourse on their interrelationships. Low socio-economic status (SES) and its associated issues, such as inadequate housing, are likely significant in the relationship between behavioral risk factors and communicable illnesses, while the impact of low SES and related elements remains largely unexplored. The review could not examine the impact of low socioeconomic status (SES) since several of the included studies did not address low SES in their analysis. Numerous research included are worldwide syntheses; nonetheless, the correlations between behavioral risk factors and communicable illnesses may differ among nations. Only English-language publications were selected, indicating that research in other languages may have been overlooked. Ultimately, conclusions must account for publication bias; studies are more likely to be published if they demonstrate significant effects rather than null results [60], thus those indicating a correlation between behavioral risk factors and communicable diseases are more likely to be recognized.

This study revealed multiple deficiencies in the existing systematic review literature concerning particular behavioral risk factors and prevalent communicable diseases, notably research investigating the correlation between physical inactivity and inadequate dietary practices with communicable diseases, necessitating immediate further investigation. Recent work has shown the significant impact of physical inactivity on the risk of severe COVID-19 [2]. The study's restriction to systematic reviews precluded a thorough comparison of behavioral risk variables across various disease types; however, future studies may provide such comparisons. It was observed that evaluations investigating the correlation between communicable illnesses and alcohol or illicit drug use were concentrated on tuberculosis, HIV, and hepatitis, whereas papers addressing the link with obesity primarily focused on pneumonia, influenza, and COVID-19. Additional research elucidating the complex relationships between individual behavioral risk factors and specific disease types, as well as the mechanisms underlying these connections, would offer a valuable framework for comprehending the impact of current and future communicable diseases on various population groups. Ultimately, the results underscore a potential avenue for future study to investigate the effectiveness of behavioral risk factor preventive strategies in mitigating the burden of communicable diseases.

8. Conclusions

Behavioral risk factors significantly influence the likelihood of developing and experiencing more severe effects from prevalent communicable illnesses. These risk factors are mostly controllable or avoidable. The prevention of communicable illnesses is most effective when it addresses behavioral risk factors typically linked to non-communicable diseases, especially among poor communities. These results are crucial for comprehending the hazards linked to communicable diseases and are relevant, considering the ongoing COVID-19 pandemic and the need for enhancements in future pandemic preparation. Mitigating behavioral risk factors must be a crucial component in efforts to enhance resilience against developing and future epidemics and pandemics. Moreover, the pandemic presents a pertinent opportunity for public education on how enhancing overall health by mitigating risk behaviors linked to non-communicable diseases may safeguard against future infections such as COVID-19.

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مراجعة شاملة لعوامل الخطر السلوكية المرتبطة بالأمراض المعدية

الملخص

الخلفية: سلطت جائحة COVID-19 الضوء على ضعف الأفراد الذين يعانون من عوامل خطر سلوكية قابلة للتعديل، مثل التدخين، والإفراط في استهلاك الكحول، والسمنة، وقلة النشاط البدني، أمام النتائج الصحية الخطيرة. تنتشر هذه العوامل عبر كل من الدول ذات الدخل المرتفع والدخل المنخفض والمتوسط، مما يؤدي إلى تفاقم التفاوتات الصحية ويؤثر على انتقال الأمراض المعدية وشدتها.

الطرق: تتضمن هذه المراجعة تلخيص الأدبيات المتاحة من خلال البحث في قواعد بيانات إلكترونية مثل bioRxiv و medRxiv و ChemRxiv و Google Scholar و PubMed. تركز المراجعة على الأمراض المعدية الكبرى، وخصوصًا الإنفلونزا والعدوى التنفسية والأمراض المنقولة جنسيًا (STIs)، لتحليل تأثير عوامل الخطر السلوكية على العدوى والنتائج الصحية.

النتائج: حددت المراجعة ارتباطات كبيرة بين عوامل الخطر السلوكية المختلفة والأمراض المعدية. وُجد أن استهلاك الكحول يزيد من خطر الإصابة بالسل (TB) وفيروس نقص المناعة البشرية (HIV) والالتهاب الرئوي. وبالمثل، تم ربط تعاطي المخدرات غير المشروعة وقلة النشاط البدني والسمنة بزيادة القابلية للإصابة بالأمراض ونتائج صحية أكثر شدة. كما تم ربط التدخين والتعرض للتدخين السلبي بارتفاع مخاطر الإصابة بالعدوى التنفسية والسل.

الاستنتاج: تلعب عوامل الخطر السلوكية دورًا حاسمًا في تحديد معدلات الإصابة وشدّة الأمراض المعدية. يمثل التصدي لهذه العوامل أمرًا ضروريًا لاستراتيجيات الوقاية الفعالة، خاصةً في المجتمعات المهمشة. تؤكد النتائج على الحاجة إلى تدخلات صحية عامة تستهدف تعديل هذه السلوكيات لتعزيز المرونة ضد التهديدات الحالية والمستقبلية للأمراض المعدية.

الكلمات المفتاحية: الأمراض المعدية، عوامل الخطر السلوكية، COVID-19، الصحة العامة، استراتيجيات الوقاية.