

Prevalence Rates of Tuberculosis, Human Immunodeficiency Virus, and Hepatitis B and C among Migrant Workers in Jordan

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Abstract

Introduction: Migration across national borders is an influential factor of consideration in the control of infectious diseases. Therefore, including migrants in surveillance and screening programs as well as linkage to care is mandatory to meet the public health targets of countries and regions. This study aimed to determine the prevalence of tuberculosis (TB), human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) among migrant workers applying for work permits in Jordan during the period 2018–2020. The findings of this study are expected to guide health policy to prevent the spread of infectious diseases in Jordan. **Methods:** During the period 2018–2020, 439,622 migrant workers underwent routine testing for TB, HIV, and hepatitis B and C. Demographic, laboratory, and clinical data for those migrants were retrieved from the Directorate of Chest Diseases and Immigrants Health records. The overall prevalence of the mentioned diseases as well as by subgroups was calculated. **Results:** The prevalence rates of TB and HIV among migrants were 54 per 100,000 migrants (11 per 100,000 male migrants and 138 per 100,000 female migrants, $P < 0.001$) and 21 per 100,000 (11 per 100,000 male migrants and 41 per 100,000 female migrants, $P < 0.001$), respectively. The prevalence of hepatitis B was 10 per 1000 migrants (12 per 1000 male migrants and 7 per 1000 female migrants, $P < 0.001$) and the prevalence of hepatitis C was 37 per 1000 (51 per 1000 male migrants and 10 per 1000 female migrants, $P < 0.001$). The prevalence of all studied conditions varied significantly according to gender, age, occupation, and country of origin. **Conclusions:** The prevalence rates of TB, HIV, HBV, and HCV were generally higher among migrants than Jordanians. Evidence-based health policies need to be drafted that aim to address migrant workers health care to ensure the lowest possible risk from infectious diseases to the people of Jordan is maintained. The study findings can inform the formulation of immigration and public health policies, including screening requirements for migrant workers, health insurance provisions, labor regulations, and support services for those with these conditions.

Keywords: Hepatitis B, hepatitis C, human immunodeficiency virus, migrants, tuberculosis

INTRODUCTION

Tuberculosis (TB) is one of the top 10 causes of death and the leading cause from a single infectious agent in 2019 according to the World Health Organization (WHO), affecting all countries as well as every age group.^[1] In 2019, 10 million people were diagnosed with active TB worldwide while 1.4 million people died with TB in the same year.^[2] Similarly, the human immunodeficiency virus (HIV) is one of the world most serious public health challenges. Approximately 37.7 million individuals worldwide were infected with HIV/AIDS in 2020; and the number of patients died from HIV-related causes was 680,000 in the same year.^[3] Hepatitis B virus (HBV)

and hepatitis C virus (HCV) are considered the most common causes of liver diseases worldwide.^[4] The estimated prevalence of HBV and HCV infections worldwide in 2015 and 2016

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were 3.61% and 2.5%, respectively.^[5,6] The estimated number of patients in 2019 with a chronic hepatitis B was 296 million with an annual rates of 1.4 million per year and a mortality rate of 820,000 deaths per year, where the estimated number of people with chronic hepatitis C in the same year was 58 million with an annual rate of 1.5 million per year and a mortality rate of 290,000 deaths per year.^[7,8]

In the Eastern Mediterranean Region (EMR), the estimated number of TB cases in 2019 was 819,000 cases, with a total TB incidence of 114 per 100,000 populations per year.^[9,10] The EMR is one of the regions that accounts for the highest burden of hepatitis C disease, with 12 million people chronically infected.^[7] Jordan with a total population of 10.4 million in 2020^[11] is considered a low TB incidence country, with a TB incidence of 5.5 cases per 100,000 populations in 2019.^[9,10] In 2017, the cumulative number of detected HIV/AIDS cases in Jordan was 1408, including 383 Jordanians, of whom 34% ($n = 129$) died. The estimated prevalence rates for HBV (2016) and HCV (2013) infections in Jordan are relatively low, about 2.4% and 0.42%, respectively.^[12,13]

International migration involves the movement of people across international borders with the intention of establishing residence in a new country. Migrants choose to relocate and typically have the option to return to their home country safely. In contrast, refugees are compelled to leave their home country due to conflict or persecution, and they cannot return safely. In the past two decades, migrations increased markedly within the international scope; the number of international migrants increased from 173 million in 2000 to reach 281 million in 2020, with an increase of 12% over 20 years.^[14]

Migrants are not inherently vulnerable, but they may find themselves in precarious situations influenced by a complex interplay of situational and personal factors. These factors include the motivations for leaving their home country, the conditions they face during their journey and upon arrival, as well as their individual characteristics. Migration across national borders is an influential factor of consideration in the control of infectious diseases. The migrant population is a vulnerable group for widespread health problems and communicable diseases such as TB, HIV/AIDS, and hepatitis B and C.^[15-17] Therefore, including migrants in surveillance and screening programs as well as linkage to care is mandatory to meet the public health targets of countries and regions.^[15,16,18,19] Migrants may also encounter human rights violations stemming from discrimination, inequality, and societal dynamics.

Jordan exhibits three interconnected patterns of migration: labor migration, forced migration, and mixed migration flows. Labor migration constitutes 18% of the total migrant population, forced migration accounts for approximately 56%, while other types of flows, such as dependents, tourism, study, and healthcare, make up 26% of the total migrant population in Jordan.^[20] The number of migrant workers in Jordan is estimated to be more than 1.5 million expatriate workers,

mainly from Egypt, Syria, the Philippines, Bangladesh, and other Southeast Asian countries.^[21] Male migrants holding labor permits in Jordan are predominantly engaged in agriculture (31%), construction (23%), and manufacturing services (14%). In contrast, female migrants are primarily involved in household domestic work, comprising more than half of work permits (53%), and they also play a significant role in the manufacturing industry, especially in apparel and garment production, making up approximately 40% of the workforce.^[20]

Addressing the issue of infectious diseases among migrants in Jordan is imperative for the development of effective public health policies that not only protect the health and well-being of migrants but also mitigate the risk of infectious diseases spreading within the broader population of Jordan. Understanding the prevalence of infectious diseases among migrant workers is pivotal for evaluating their impact on public health. These diseases can impose a significant burden on both migrant and host populations, and monitoring their prevalence is vital for disease control and prevention. Having knowledge of disease prevalence among migrant workers enables health-care systems to create tailored services and interventions that cater to the unique healthcare needs of this population. Moreover, many of the expatriate workers are in close contact with Jordanian citizens and can transmit the infection to them. This study aimed to determine the prevalence of TB, HIV, HBV, and HCV among migrant workers applying for work permits during the period 2018–2020. The findings of this study are expected to guide health policy to prevent the spread of infectious diseases in Jordan. The findings from this study are expected to guide the formulation of evidence-based health policies and strategies specifically aimed at addressing the healthcare needs of migrant workers.

METHODS

A descriptive study involving the secondary analysis of clinical and laboratory data was conducted, encompassing all migrant workers in Jordan who underwent routine testing for TB (Chest X-ray [CXR]), HIV, hepatitis B, and hepatitis C from 2018 to 2020.

In alignment with Jordanian Cabinet Decision number 91, dated October 24, 2019, all migrants entering the country are required to undergo mandatory testing within 30 days of arrival for syphilis, human HIV, hepatitis B and C, TB, and pregnancy, in one of the 12 TB centers distributed around the country, all essential for the issuance of work permits and the annual renewal of permits. In addition, they perform urine tests and blood chemistry analyses. The work permit is issued for 1 year and should be renewed every year.

The Directorate of Chest Diseases and Immigrants Health in Amman receives data about the health of all migrant workers in the country using an electronic system. During the period 2018–2020, 439,622 migrant workers underwent

routine testing for TB (CXR), HIV, and hepatitis B and C. Demographic, laboratory, and clinical data for those migrants were retrieved from the Directorate of Chest Diseases and Immigrants Health records. Demographic data included age, gender, occupation, and country of origin. Laboratory data included lab results for HIV (HIV-antigen and antibody), hepatitis B surface antigen (HBsAg), and Hepatitis C (Hepatitis C-antibody). For TB, a Mantoux test (PPD) is performed. If the Mantoux test is positive, CXR is performed.

A confirmed case of HIV is established when an individual tests positive through both enzyme-linked immunosorbent assay and Western blot. TB is diagnosed in a person who exhibits characteristic X-ray changes and tests positive through either acid-fast bacillus culture or Genexpert. A diagnosis of hepatitis B is confirmed when an individual tests positive for the presence of HBsAg. Hepatitis C is identified when an individual tests positive through antibody testing.

The study received ethical approval from the Research Ethics Committee at the Jordan Ministry of Health (ID: MBA-4746) on March 31, 2021, confirming compliance with ethical guidelines and regulations. The study used routinely collected data and therefore, carries no harm to any of the migrant workers. No identifying information was collected, and the data were used only for scientific purposes by researchers.

IBM SPSS version 24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY, USA: IBM Corp) was used for the data analysis. The overall prevalence of the mentioned diseases as well as by subgroups was calculated.

The prevalence rates were compared using the Chi-square test. $P \leq 0.05$ was considered statistically significant.

RESULTS

Socio-demographic characteristics

This study included the data on 439,622 migrant workers (67% [$n = 292,187$] males and 34% [$n = 147,435$] females). About 30% of migrant workers were aged <30 years, 30% were aged between 30 and 35 years, and 40% were older than 35 years. About 56% of migrants were from Arab countries including Egypt, Iraq, Yemen, and Sudan, while 34% were from other countries including Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana. Almost 62.1% were laborers and 14.4% were servants and janitors. Table 1 shows the sociodemographic characteristics of migrants who underwent routine testing for TB, HIV, and hepatitis B and C in 2018–2020.

Prevalence of tuberculosis among migrant workers

The prevalence of TB was 54 per 100,000 migrants (11 per 100,000 male migrants and 138 per 100,000 female migrants, $P < 0.001$) [Table 2]. The prevalence was the highest among servants and janitors (213.5 per 100,000 migrants tested) followed by that among professionals (139.7 per 100,000) ($P < 0.001$) [Table 3]. For the rest of occupations, the rate was low. The prevalence of TB varied significantly ($P < 0.001$) among the four groups of countries; the rate was highest (143.0 per 100,000) among migrants' form countries including Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana while it was the lowest (1.2 per 100,000) among migrants from Arab countries (Egypt, Iraq, Yemen, and Sudan).

Table 1: Sociodemographic characteristics of migrants who underwent routine testing for tuberculosis, human immunodeficiency virus, hepatitis B virus and hepatitis C virus in Jordan in 2018–2020

Variable	Gender		Total ($n=439,622$)	P
	Female ($n=147,435$), n (%)	Male ($n=292,187$), n (%)		
Age (years)				
<30	59,478 (40.3)	76,086 (26.0)	135,564	<0.001
30–35	51,253 (34.8)	78,997 (27.0)	130,250	
>35	36,704 (24.9)	137,104 (46.9)	173,808	
Country				
Arab countries (Egypt, Iraq, Yemen, Sudan)	16,658 (11.3)	229,374 (78.5)	246,032	<0.001
USA and Europe countries	1630 (1.1)	1469 (0.5)	3099	
Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana	109,544 (74.3)	41,484 (14.2)	151,028	
Other countries	19,603 (13.3)	19,860 (6.8)	39,463	
Occupation				
Manual professions	7342 (5.0)	29,720 (10.2)	37,062	<0.001
Administrators and employees	748 (0.5)	2454 (0.8)	3202	
Professionals (science and engineering professionals, health professionals, teaching professionals, legal professionals, and information technology professionals)	22,450 (15.2)	9048 (3.1)	31,498	
Laborer	55,558 (37.7)	217,584 (74.5)	273,142	
Servants and janitors	47,140 (32.0)	16,085 (5.5)	63,225	
Others	14,197 (9.6)	17,296 (5.9)	31,493	

Table 2: The prevalence of tuberculosis, human immunodeficiency virus, and hepatitis B and C among migrants who underwent routine testing in 2018–2020

Disease*	Female (n=147,435)		Male (n=292,187)		Total (n=439,622)	
	n	Prevalence (95% CI)	n	Prevalence (95% CI)	n	Prevalence (95% CI)
TB (per 100,000)	204	138 (119–157)	32	11 (7–15)	236	54 (47–61)
HIV (per 100,000)	60	41 (30–51)	33	11 (7–15)	93	21 (17–25)
Hepatitis B (per 1000)	972	7 (6–7)	3625	12 (12–13)	4597	10 (10–11)
Hepatitis C (per 1000)	1468	10 (9–10)	14,967	51 (50–52)	16,435	37 (37–38)

*The gender-differences were statically significant for all conditions ($P < 0.001$). HIV: Human immunodeficiency virus, CI: Confidence interval, TB: Tuberculosis

Table 3: The prevalence rates of tuberculosis, human immunodeficiency virus, and hepatitis B and C among migrants who underwent routine testing in 2018–2020 according to sociodemographic characteristics*

Variable	Total N	TB		HIV		Hepatitis B		Hepatitis C		
		n	Prevalence (per 100,000)	n	Prevalence (per 100,000)	n	Prevalence (per 1000)	n	Prevalence (per 1000)	
Age										
<30	135,564	76	56.1	44	32.5	1009	7.43	1982	14.6	
30–35	130,250	69	53.0	25	19.2	1357	10.4	3278	25.2	
>35	173,808	91	52.4	24	13.8	2231	12.8	11,175	64.3	
Gender										
Female	147,435	204	138.4	60	40.7	972	6.6	1468	10.0	
Male	292,187	32	11.0	33	11.3	3625	12.4	14,967	51.0	
Occupation										
Manual professions	37,062	6	16.2	6	16.2	449	12.1	2004	54.1	
Administrators and employees	3202	0	0.0	0	0.0	18	5.6	13	4.1	
Professionals**	31,498	44	139.7	6	19.0	122	3.9	69	2.2	
Laborer	273,142	47	17.2	32	11.7	3530	12.9	12,249	44.8	
Servants and janitors	63,225	135	213.5	39	61.7	293	4.6	1698	26.9	
Others	31,493	4	12.7	10	31.8	185	5.9	402	12.8	
Country										
Arab countries (Egypt, Iraq, Yemen, Sudan)	246,032	3	1.2	18	7.3	2791	11.3	15,025	61.1	
USA and Europe countries	3099	0	0.0	1	32.3	1	0.3	11	3.6	
Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana	151,028	216	143.0	59	39.1	1266	8.4	1199	7.9	
Other countries	39,463	17	43.1	15	38.0	539	13.6	200	5.1	

*The differences in prevalence rates for conditions according to all studied variables are significant ($P < 0.001$), **Professionals include science and engineering professionals, health professionals, teaching professionals, legal professionals, and information technology professionals. HIV: Human immunodeficiency virus, TB: Tuberculosis

Prevalence of human immunodeficiency virus among migrant workers

The prevalence of HIV was 21 per 100,000 per migrant workers tested (11 per 100,000 male migrants and 41 per 100,000 female migrants, $P < 0.001$) [Table 2]. The prevalence varied significantly according to the occupation ($P < 0.001$) and country of origin ($P < 0.001$). The prevalence was the highest among migrants <30 years old (32.5 per 100,000) and among servants and janitors (61.7 per 100,000). It was the lowest among migrants from Arab countries (7.3 per 100,000) [Table 3].

Prevalence of hepatitis B and C among migrant workers

The prevalence of Hepatitis B was 10 per 1000 (12 per 1000 male migrants and 7 per 1000 female migrants, $P < 0.001$) and the prevalence of Hepatitis C was 37 per 1000

(51 per 1000 male migrants and 10 per 1000 female migrants, $P < 0.001$) [Table 2]. The prevalence of Hepatitis B was the highest among migrants >35 years old (12.8 per 1000) as well as among laborers (12.9 per 1000) and manual professionals (12.1 per 1000) [Table 3]. The prevalence of Hepatitis C was the highest among migrants >35 years old (64.3 per 1000) as well as among laborers (44.8 per 1000) and manual professionals (54.1 per 1000). Migrants from Arab countries had the highest prevalence of Hepatitis C (61.1 per 1000).

DISCUSSION

Migration is an intrinsic phenomenon of population dynamics, driven by socio-economic, political, and environmental factors. The migration flows toward Jordan have increased throughout the last decade and have raised fears regarding

the epidemiological pattern of infectious diseases observed in Jordan and their impact.^[22] In cases where individuals are diagnosed with AIDS, hepatitis B, or hepatitis C, they face deportation to their country of origin. Those found to be infected with TB receive treatment if the disease is in its active phase, followed by deportation once treatment is complete.

A total of 439,622 individual workers were included in this study. Males are overrepresented in this study and this reflects the higher proportions of males than females who migrated to the country in the last 3 years. The findings of this study indicated that the prevalence rates of infectious diseases, including TB, HIV, HBV, and HCV are higher than the estimated rates in Jordan. Similarly, studies in other countries showed that the prevalence of such diseases is higher among migrants than that in the host population.^[23]

Migrant workers constitute a high-risk group and they are in need of special attention by the health sector of this country.^[24,25] For this reason, it is highly required to proceed with a program and apply some strategies to help minimize the risk of these infections among migrant workers.

TB control in Jordan is a model for the region. Jordan has the lowest TB incidence when compared with other neighboring countries such as Syria, Iraq, and Lebanon.^[17] The Jordan National Tuberculosis Program reached the Millennium Development Goal for TB reduction in 2011 and was preparing to shift to TB elimination. However, TB elimination planning has been disrupted due to the influx of Syrian refugees.^[9] In 2013, Jordan's TB incidence rate was 6 per 100,000 population,^[26] and significant progress was made in further decreasing incidence, however this then stalled.^[27] In 2019, the incidence of TB for Jordan was 5.5 cases per 100,000 people.^[1] This study has indicated a high prevalence of TB in the migrant workers' population, especially in low economic countries (the Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana). It demonstrates the significant status of these diseases and identifies a specific and serious health need within the migrant population. The number of newly diagnosed TB cases in the EMR decreased by 15% in 2020 compared to 2019, largely due to the impact of the COVID-19 pandemic.^[28] A recent study in Jordan has also reported a decline in TB notifications in 2020, underscoring the repercussions of COVID-19 on TB diagnosis and management.^[29]

In the case of HIV, there is a global commitment to preventing new infections and ensuring that everyone with HIV has access to HIV treatment. For example, Non-Jordanians, except UN agencies and diplomatic corps, are subjected to HIV testing before giving them a residence permit. Those who test positive are deported from the country.^[30] However, in the case of TB, all migrants with active TB are treated until they get negative results for TB, then they be transferred to their countries. In case they have latent TB, they get transferred directly to their countries according to the law in Jordan. Although there is an objection from WHO regarding this policy, the Jordanian Department of Health initiated this response to relieve the

pressure on its strained health system. This policy ensures the early detection and treatment and minimizes the risk of transmission to others living in Jordan.

The migrants from Philippines, India, Bangladesh, Sri Lanka, Ethiopia, Uganda, and Ghana, in general, had a higher HIV prevalence than the Jordanians. The prevention is the foremost viable strategy in countries with a low prevalence of HIV, and in the last 2 years, the Jordanian government has increased the attention paid to preventing the HIV epidemic from gaining a foothold in the population.^[31]

Studies on the prevalence of HBV infection in migration workers found that HBV infection was the most common cause of unfitness among all the workers, followed by chronic diseases and HCV.^[32] The pattern of these diseases among workers is consistent with the pattern of disease in most Asian and African countries where infectious diseases are more common.^[33] In our study, we found that HCV was the most abundant infectious disease in migrant workers in Jordan and the most common cause of unfitness among the worker in this study. The reason for the high rate of HCV infection is due to higher number of migrants from Egypt which has the highest prevalence in the EMR.^[34]

The research has successfully provided important information and a relatively sufficient database regarding the migrant workers in Jordan and the prevalence rates of TB, HIV, HBV, and HCV among them. However, it is important to acknowledge certain limitations. The study relied on data retrieved from the Directorate of Chest Diseases and Immigrants Health records. The accuracy and completeness of these records can vary, potentially introducing data quality and reporting bias concerns. While the study acknowledges variations in prevalence rates by gender, age, occupation, and country of origin, it does not extensively explore the complex interplay of these factors or other potential confounding variables.

CONCLUSIONS

The prevalence rates of TB, HIV, HBV, and HCV were generally higher among migrants than Jordanians. These rates varied significantly by country of origin, age, gender, and occupation. Health authorities in Jordan must remain aware of the risk of transmission of the mentioned diseases. Evidence-based health policies need to be drafted that aim to address migrant workers health care to ensure the lowest possible risk from infectious diseases to the people of Jordan is maintained. The fact that there is a paucity of published literature on the topic in Jordan that looks at the migrant subgroup regarding infectious diseases such as TB, HIV/AIDS, HBV, and HCV indicates that further research is needed. This is specially the case to provide more data on just how these migrant workers affect the Jordanian population and which policies work to reduce the burden of disease in Jordan. The study findings can inform the formulation of immigration and public health policies, including screening requirements for migrant workers, health insurance provisions, labor regulations, and support services

for those with these conditions. The significant variations in prevalence rates of TB, HIV, hepatitis B, and hepatitis C based on gender suggest the need for further research into the underlying causes of these gender disparities. Theoretical studies can explore the sociocultural and biological factors contributing to these differences.

Research quality and ethics statement

This study was approved by the Research Ethics Committee at the Jordan Ministry of Health (ID: MBA-4746). The authors followed applicable EQUATOR Network guidelines during the conduct of this research project.

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Conflicts of interest

There are no conflicts of interest.

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