Akor et al. *Afr. J. Clin. Exper. Microbiol.* 2022; 23 (2): 215 - 220 https://www.afrjcem.org

African Journal of Clinical and Experimental Microbiology. ISSN 1595-689X Apr 2022; Vol.23 No.2
AJCEM/2160. https://www.ajol.info/index.php/ajcem

Short Communication **Open Access**

Infectious diseases co-morbidities among patients attending Kogi State University Teaching Hospital: a ten-year retrospective study

*[1,2]Akor, S. E., [1,2]Onoja-Alexander, M. O., [1,2]Agbanna, B. E., [3]Musa, D. A., [2]Priscilla, O. O., [2]Agama, O. G., and [2]Faith, F. J.

[1]Kogi State University, Anyigba, Nigeria
[2]Kogi State University Teaching Hospital, Anyigba, Nigeria
[3]Trans-Saharan Diseases Research Centre, Ibrahim Badamasi Babangida University, Lapai, Nigeria
*Correspondence to: shedrackegbnunu@gmail.com; +2348065336131

Abstract:

Background: Co-existence of more than one acute or chronic infectious diseases in a person either concurrently or sequentially with consequent economic burden varies differently from one part of the world to another, with regional and population specific patterns. This study aims to provide co-morbid patho-epidemiological pattern of six infectious diseases; HIV, tuberculosis (TB), malaria, syphilis, hepatitis B and hepatitis C virus infections.
Methodology: This research is a ten-year retrospective review of records of patients admitted at various wards of Kogi State University Teaching hospital and referred to the Laboratory Department of the hospital for investigations between June 2012 and July 2021. HIV was screened using the national serial algorithm, TB was diagnosed with the GeneXpert MTB, malaria parasite was identified by blood film microscopy, and syphilis, hepatitis B and hepatitis C viruses were screened using rapid diagnostic kits. Data were analysed with SPSS version 23.0 and association of variables with respect to gender and age group was determined using Chi square, with $p< 0.05$ considered to be statistically significant.
Results: A total of 223 patients were retrospectively reviewed with 102 (45.7%) males and 121 (54.3%) females. Co-morbidities occurred most frequently among age groups 21-30 years (34.1%), 31-40 years (39.0%) and 41-50 years (16.6%). The most frequent co-morbidity pattern was HIV/TB (81.6%) followed by HBV/MP (4.5%), HIV/HBV (4.0%), HIV/MP (3.1%), TB/MP (2.7%), HBV/HCV (2.2%) while HCV/MP, TB/HCV, HCV/syphilis, and TB/HBV were (0.4%) each. There was no significant difference in the frequency of co-morbidity with respect to gender and age groups of patients ($p>0.05$).
Conclusion: Co-existence of chronic infectious disease in a person increases the risk of morbidities and mortalities. Therefore, diagnosis, and concurrent treatment and management of co-morbid infectious diseases should be incorporated into our routine healthcare system and appropriate resources should be allotted for this in health plans.

Keywords: co-morbidity, retrospective, patho-epidemiological, infectious diseases

Received Nov 24, 2021; Revised Jan 22, 2022; Accepted Jan 23, 2022

Co-morbidités des maladies infectieuses chez les patients fréquentant l'hôpital universitaire de l'État de Kogi: une étude rétrospective sur dix ans

*[1,2]Akor, S. E., [1,2]Onoja-Alexander, M. O., [1,2]Agbanna, B. E., [3]Musa, D. A., [2]Priscilla, O. O., [2]Agama, O. G., et [2]Faith, F. J.

[1]Université d'État de Kogi, Anyigba, Nigéria
[2]Hôpital universitaire d'État de Kogi, Anyigba, Nigéria
[3]Centre de Recherche sur les Maladies Trans Sahariennes, Université Ibrahim Badamasi Babangida, Lapai, Nigéria
*Correspondance à: shedrackegbnunu@gmail.com; +2348065336131

Résumé:

Contexte: La coexistence de plusieurs maladies infectieuses aiguës ou chroniques chez une personne, simultanément ou séquentiellement, avec un fardeau économique conséquent, varie différemment d'une partie du monde à l'autre, avec des schémas régionaux et spécifiques à la population. Cette étude vise à fournir le schéma patho-épidémiologique comorbide de six maladies infectieuses; VIH, tuberculose (TB), paludisme, syphilis, infections par le virus de l'hépatite B et de l'hépatite C.
Méthodologie: Cette recherche est un examen rétrospectif sur dix ans des dossiers de patients admis dans divers services de l'hôpital universitaire de l'État de Kogi et référés au département de laboratoire de l'hôpital pour des enquêtes entre juin 2012 et juillet 2021. Le VIH a été dépisté à l'aide de la série nationale algorithme, la tuberculose a été diagnostiquée avec le GeneXpert MTB, le parasite du paludisme a été identifié par microscopie de frottis sanguin et les virus de la syphilis, de l'hépatite B et de l'hépatite C ont été dépistés à l'aide de kits de diagnostic rapide. Les données ont été analysées avec SPSS version 23.0 et l'association des variables par rapport au sexe et au groupe d'âge a été déterminée à l'aide du Chi carré, avec $p<0,05$ considéré comme statistiquement significatif.
Résultats: Un total de 223 patients ont été revus rétrospectivement avec 102 (45,7%) hommes et 121 (54,3%) femmes. Les comorbidités sont survenues le plus fréquemment dans les groupes d'âge 21-30 ans (34,1 %), 31-40 ans (39,0%) et 41-50 ans (16,6%). Le schéma de comorbidité le plus fréquent était le VIH/TB (81,6%), suivi du VHB/MP (4,5%), du VIH/VHB (4,0%), du VIH/MP (3,1%), de la TB/MP (2,7%), du VHB/VHC (2,2%) tandis que VHC/MP, TB/VHC, VHC/syphilis et TB/VHB étaient (0,4%) chacun. Il n'y avait pas de différence significative dans la fréquence des comorbidités en fonction du sexe et des tranches d'âge des patients ($p>0,05$).
Conclusion: La coexistence de maladies infectieuses chroniques chez une personne augmente le risque de morbidité et de mortalité. Par conséquent, le diagnostic, le traitement et la gestion concomitants des maladies infectieuses comorbides doivent être intégrés à notre système de soins de santé de routine et des ressources appropriées doivent être allouées à cet effet dans les plans de santé.

Mots-clés: comorbidité, rétrospective, patho-épidémiologique, maladies infectieuses

Introduction:

Infectious disease is a state in which pathogens such as bacterial, virus, fungi and parasite cause sufficient tissue damage while living and reproducing in host tissues (1). The concept of co-morbidity is the co-existence of more than one acute or chronic disease in one person either concurrently or sequentially. People living with acute or chronic primary infectious diseases are at higher risk of developing secondary infections (2). The global burden of co-existing infectious diseases, in particular human immunodeficiency virus (HIV), hepatitis B and C, tuberculosis (TB), malaria and syphilis in a person either concurrently or sequentially, accounts for quarter to a third of deaths worldwide (3). According to the WHO report of 2004 (4), children under five years of age account for over half of these mortalities with the fastest increase recorded in low and middle-income countries, particularly the sub-Saharan Africa.

A population-based study indicated that many tropical infectious diseases exhibit common epidemiological characteristics with age and shared mutual risk factors including poor sanitation and socioeconomic lifestyles that enhances the co-existence of these organisms in the same person with resulted concomitant morbidity (5). Viral hepatitis is one of the leading disease responsible for morbidity and mortality among persons infected with HIV (6). Of 33 million people living with HIV globally, 5-20% are co-infected with hepatitis B virus and 5-15% with hepatitis C, notwithstanding, the percentage may be up to 90% among drug addicts who inject drugs (7). Global emergencies of TB and HIV/AIDS co-infection are the major cause of death among people living with HIV (8). The morbid interaction between these two chronic diseases accounts for 25% of HIV-associated deaths globally and has increased the burden of tuberculosis by twenty to forty-fold with the greatest global burden of HIV-related TB epidemic in sub-Saharan Africa (9).

Syphilis and other infectious diseases are often co-morbid; most of these co-exist chronic infectious diseases are asymptomatic. However, even asymptomatic infectious diseases can cause complications by suppressing the infected host immune systems (10). Although there are considerable studies on hepatitis B/C, HIV/TB, HIV/hepatitis B, HIV/hepatitis C and HIV/malaria co-morbidity and co-infections, there is distinctly fewer reports of clinical and immunological morbid interactions between TB/malaria, syphilis/malaria and other related infe-

ctious diseases. The epidemiological links between chronic infectious diseases are not well established, unlike HIV/AIDS, hepatitis B and C, and syphilis. Tuberculosis and malaria are ancient infectious diseases that have molecular evidence of co-existence, and co-evolved in the same human populations over millennia as demonstrated in mummified remains of 2000-3000 years old from Lower Egypt (11).

For this study, we focused on close co-morbid relationship between six common chronic infectious diseases in this geopolitical area, namely HIV/AIDS, TB, syphilis, malaria, hepatitis B and C viral infections, with the aim of providing co-morbid patho-epidemiological pattern that may be selectively used for epidemiological control and therapeutic management.

Materials and method:

Study design and subjects

This study is a ten-year retrospective review of records of patients admitted at various wards of Kogi University Teaching Hospital and referred to the Medical Laboratory Department for investigations of suspected HIV, tuberculosis, syphilis, malaria, hepatitis B and C virus infections from June 2012 to July 2021. The Research and Ethical Committee of the Kogi State University Teaching Hospital (KSUTH) approved the study.

Study population and data collection

A total of two hundred and twenty-three (223) patients referred to the Medical Laboratory Department of the hospital for investigations on suspicion of different infective conditions, who were confirmed to have concurrent or sequential co-infections of HIV, TB, syphilis, malaria, hepatitis B and hepatitis C, were studied. A designed data collection proforma was used to retrieve demographic information (age and gender) of each participant, detail of the tests performed and the results from laboratory register. The laboratory investigation methods used during the period of the study included; serology for HIV detection that was interpreted based on the national serial algorithm, TB was detected by the GeneXpert MTB, malaria parasite was detected by blood film microscopy, and syphilis, hepatitis B and C virus infections were screened using LabACON rapid diagnostic kits.

Statistical analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 23.0. Frequency distribution tables were generated while categorical variables were compared using Chi square (X^2) test to determine association of co-morbidity with respect to gender and age groups of patients. A p-value less 0.05 was considered as statistically significant.

Results:

A total of 223 patients with co-morbid infections were retrospectively studied, with mean age of 34.89±9.88 years, median age of 35.0 years, modal age of 30.0 years, and age range of 8-72 years. The gender distribution showed that 45.7% (102/223) were males while 54.3% (121/223) were females (Table 1). The most frequent co-infection was HIV/TB (81.6%, 182/223) followed by HBV/MP (4.5%), HIV/HBV (4.0%), HIV/MP (3.1%), TB/MP (2.7%), HBV/HCV (2.2%), HCV/MP (0.4%), TB/HCV (0.4%), HCV/syphilis (0.4%), and TB/HBV (0.4%). On univariate analysis, there was no significant difference (p>0.05) in the prevalence of all the co-infections in the patients with respect to gender (Table 1).

The age-related prevalence of co-morbidities were 0.9%, 3.6%, 34.1%, 39.0%, 16.6%, 4.9% and 0.9% among age groups <10, 11-20, 21-30, 31-40, 41-50, 51-60 and >60 years respectively (Table 2). The frequency of co-morbidities was highest in the age groups 21-30 years (34.1%), 31-40 years (39.0%) and 40-50 years (16.6%). Although the most frequent co-morbid infection (i. e. HIV/TB) among the patients also occurred most frequently in these three age groups (82.0%, 164/200), this was not significantly different from the frequency of HIV/TB co-infection in other age groups (78.3%, 18/23) (OR=1.265, 95% CI=0.4407.633, p=0.5833) (Table 2).

Table 1: Univariate analysis of co-infections among patients attending Kogi State University Teaching Hospital (2012-2021) in relation to gender

Co-infection	No of patients	No of male (%)	No of female (%)	OR	95% CI	p value
HIV/TB	182	86 (47.3)	96 (52.7)	1.400	0.7008 - 2.796	0.3879
HIV/MP	7	1 (14.3)	6 (85.7)	0.1898	0.02245 - 1.604	0.1287
HIV/HBV	9	2 (22.2)	7 (77.8)	0.3257	0.06611 - 1.605	0.1853
HBV/MP	10	6 (60.0)	4 (40.0)	1.828	0.5012 - 6.667	0.5184
TB/MP	6	3 (50.0)	3 (50.0)	1.192	0.2352 – 6.040	1.000
HCV/MP	1	0	1 (100.0)	0.3919	0.01578 – 9.732	1.000
TB/HCV	1	1 (100.0)	0	3.591	0.1446 – 89.184	0.4574
HCV/syphilis	1	0	1 (100.0)	0.3919	0.01578 – 9.732	1.000
HBV/HCV	5	2 (40.0)	3 (60.0)	0.7867	0.1288 – 4.804	1.000
TB/HBV	1	1 (100.0)	0	3.591	0.1446 – 89.184	1.000
Total	**223**	**102 (45.7)**	**121 (52.3)**			

HIV= Human immunodeficiency virus, TB= Tuberculosis, MP= Malaria Parasite, HBV= Hepatitis B virus, HCV= Hepatitis C Virus; OR=Odds Ratio; CI = Confidence Interval, p<0.05 is considered statistically significant

Table 2: Age group distribution of patients with co-morbidity attending Kogi State University Teaching Hospital (2012-2021)

Co-infections	Age group (years)							
	≤10	11 - 20	21 – 30	31 – 40	41 – 50	51 - 60	≥60	Total
HIV/TB	2 (1.1)	6 (3.3)	60 (32.9)$^{+}$	75 (41.2)$^{+}$	29 (16.0)$^{+}$	9 (5.0)	1 (0.5)	182
HIV/MP	0	0	3 (42.9)	1 (14.3)	2 (28.6)	1 (14.3)	0	7
HIV/HBV	0	2 (22.2)	4 (44.4)	2 (22.2)	0	1 (11.1)	0	9
HBV/MP	0	0	2 (20.0)	5 (50.0)	3 (30.0)	0	0	10
TB/MP	0	0	1 (16.7)	4 (66.7)	1 (16.7)	0	0	6
HCV/MP	0	0	1 (100.0)	0	0	0	0	1
TB/HCV	0	0	0	0	0	0	1 (100.0)	1
HCV/syphilis	0	0	1 (100.0)	0	0	0	0	1
HBV/HCV	0	0	4 (80.0)	0	1 (20.0)	0	0	5
TB/HBV	0	0	0	0	1 (100.0)	0	0	1
Total	**2 (0.9)**	**8 (3.6)**	**76 (34.1)**	**87 (39.0)**	**37 (16.6)**	**11 (4.9)**	**2 (0.9)**	**223 (100)**

HIV= Human immunodeficiency virus, TB= Tuberculosis, MP= Malaria Parasite, HBV= Hepatitis B virus, HCV= Hepatitis C Virus; $^{+}$ = The combined frequency of HIV/TB co-infection of the three most commonly affected age groups (82.0%, 164/200) was compared with the frequency of HIV/TB co-infection in other age groups (78.3%, 18/23) by Chi square test (OR=1.265, 95% CI=0.4407.633, p=0.5833, not significant).

Discussion:

The global economic burden of co-existence of infectious diseases varies differently from one part of the world to another with regional and population specific patterns. In this study, the frequency of HIV/TB co-infection among the 223 patients with co-morbidity in our study was 81.6%. This indicates that TB among people living with HIV is an emergency in this part of the world where health systems are averagely weak with greater burden of co-morbid infectious diseases. This result affirmed the previous report of WHO that sub-Saharan Africa bears 80% of global burden of HIV-associated TB (9). Therefore, there is need for a well-coordinated approach toward control, diagnosis, and concurrent treatment and management of HIV-associated TB in this region.

The HBV/MP (4.5%), HIV/MP (3.1%), TB/MP (2.7%) and HCV/MP (0.4%) pattern of malaria co-morbid relationship with other infectious diseases obtained from this study indicates that people living with HBV, HCV, HIV and TB in malaria-endemic regions are at the risk of malaria and its complications. The use of insecticide-treated nets (ITNs), indoor insecticide spraying of vector mosquitoes and intermittent preventive treatment (IPT) should be encouraged among these high-risk groups of patients. The pharmacokinetic interactions between malaria drugs and certain antiretroviral (ARV) and anti-TB drugs have been reported to share toxicity profiles (12,13). For this reason, treatment of viral hepatitis or TB and malaria co-infections in an individual should be closely monitored to avoid adverse drug reactions.

A co-morbid interaction between HIV/

HBV of 11% was reported in Nasarawa (14), 9.7% in Niger Delta (15) and 9.2% in Lagos (16). Similarly, HBV/HCV co-morbid prevalence of 5-20% was reported by WHO (7), 5% in Nasarawa (14) and 0.5% in Maiduguri (17). A 4% and 2.2% prevalence of co-infections for HIV/HBV and HBV/HCV respectively was reported in our study, which shows patho-epidemiological pattern of HIV/HBV and HBV/HCV co-morbid in individuals accessing our tertiary healthcare facility. The variations between our study and previous reports may be related to the differences in environmental factors and sociocultural practices or probably related to uncommon practice of intravenous drug abuse in our environment. The frequency of co-morbidities of 0.4% each for HCV/MP, TB/HCV, HCV/syphilis, and TB/HBV in our study appear insignificant but this may be a cause for concern especially in the area of control, diagnosis, and concurrent treatment and management of these co-morbid infectious diseases in an individual.

Co-existence of more than one acute or chronic infectious disease in a person either concurrently or sequentially due to their mode of transmission and common risk factors can increase morbidity and mortality risks when compared to a person infected with only one of these infectious diseases.

Conclusion:

Co-morbid patho-epidemiological patterns of six infectious diseases obtained from our study population is concerning for patients, healthcare providers and global communities. Therefore, diagnosis and concurrent treatment and management of co-morbid infectious diseases should be incorporated into routine health system and appropriate resources should be allotted for this in health plans.

Acknowledgements:

The authors acknowledge the staff of Kogi State University Teaching Hospital, especially Medical Records and Medical Laboratory Departments for their various contributions to this study.

Conflict of interest:

No conflict of interest is declared

References:

1. Mulugeta, A. Presentation at the Carter Centre, Ethiopia Ministry of Health and the Ethiopia ministry of Education. 2004.
2. Valderas, J. M., Starfield, B., Sibbald, B., Salisbury, C., and Roland, M. Defining comorbidity: implications for understanding health and health services. Ann Fam Med. 2009; 7 (4): 357-363.
3. World Health Organization. Preliminary results from global systematic review of prevalence of HIV/HBsAg and HIV/HCV Ab co-infection, WHO, 2015.
4. The World Health Organisation Report on Infectious Diseases, 2004.
5. Osakunor, D. N. M., Sengeh, D. M., and Mutapi, F. Coinfections and comorbidities in African health systems: At the interface of infectious and noninfectious diseases. PLoS Negl Trop Dis. 2018; 12 (9): e0006711 https://doi.org/10.1371/journal. pntd.0006711
6. World Health Organization Guidelines for the management of sexually transmitted infections. Geneva, World Health Organization, 2004 www.who.int/hiv/pub/sti/pub6/en
7. World Health Organization, Guidance on prevention of viral hepatitis B and C among people who inject drugs. Geneva, World Health Organization,2012. www.who.int/hiv/pub/guidelines/hepatitis/en/index.html
8. World Health Organization. WHO policy on collaborative TB/HIV activities: guidelines for national programmes and other stakeholders. Geneva, World Health Organization, 2012 www.who.int/tb/publications/2012/tb_hiv_policy_9789241503006/en
9. World Health Organization. Global tuberculosis report. 2012. http://www.who.int/tb/publications/global_report/en/index.html
10. World Health Organization. Prevention and treatment of HIV and other sexually transmitted infections for sex workers in low- and middle-income countries. Geneva, World Health Organization, 2012. www.who.int/hiv/pub/guidelines/sex_worker/en
11. Matthew, B., Ben, J. M., and Alimuddin, Z. Tuberculosis Comorbidity with Communicable and Non communicable Diseases. Cold Spring Harb Perspect Med. 2015; 5: a017889
12. World Health Organization. Essential prevention and care interventions for adults and adolescents living with HIV in resource-limited settings. Geneva, World Health Organization, 2008. www.who.int/hiv/pub/prev_care/OMS_EPP_AFF_en.pdf
13. World Health Organization. WHO policy recommendation: seasonal malaria chemo-prevention (SMC) for Plasmodium falciparum malaria control in highly seasonal transmission areas of the Sahel sub-region in Africa. Geneva. World Health Organization,2012 www.who.int/malaria/publications/atoz/who_smc_policy_recommendation/en/index.html.
14. Akyala, I. A., Obande, G., and David, I. Seroprevalence of Hepatitis B and C Co-Infection among Cohort Seropositive HIV Patients Accessing Health care in Nasarawa State, Northcentral Nigeria

Br J Psychol Res. 2013; 1: 15-24. www.ea-journals.org.
15. Agwale, S. M. Tamimoto, L., Womack, C., et al. Prevalence of HIV Co-infection in HIV Infected Individuals in Nigeria and Characterization of HIV Genotypes. J Med Virol. 2004; 31 (1): 53 - 56.
16. Lesi, O. A., Kehinde, M. O., Oguh, D. N., and Amira C. O. Hepatitis B and C Virus infection in Nigerian patients with HIV /AIDS. Nig Postgrad Med J. 2007; 14: 129-133.
17. Dawurung, J. S., Bukbuk, D. N., Ajayi, B. B., and Baba, M. M. Prevalence of hepatitis B and C virus co-infection among students of University of Maiduguri, Nigeria. Arch Appl Sci Res. 2012; 4 (4): 1581-1584. http://scholarsresearchlibrary.com/archive.html