

The Complexity of Communicable and Non-Communicable Diseases in Vulnerable Populations

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Abstract

Global conscience and interests are for the sustainable development and improvement of the social welfare and well-being of vulnerable populations in the interactions or comorbidities or coexistence of emerging and reemerging infectious diseases as well as erstwhile and currently detected non-communicable disorders. These will need the provision of novel or improvement of healthcare research modalities and techniques, development and promotion of evidence-based strategies in the mitigation or eradication of health development challenges and constraints within the spectrum of vulnerable populations.

Keywords: Infectious, Non-Infectious, Morbidity, Mortality, Syndemics, Coexistence, Comorbidity, Diabetes, Obesity.

Introduction

On a broad spectrum, acute, chronic, communicable and non-communicable diseases may increasingly tend towards undetermined global epidemic proportions. Comorbids or multiple, complex, and syndemic phenomena are characteristics of these untoward events. These may be inextricably linked with gene-environment interactions, physiologic, psychologic, familial, sociocultural, economic and political factors which merge to obfuscate these non-compliant health and sustainable events. Broad interactions influence these conditions, inter alia health impact in conurbations, fetal life, maternal physiology, and the thrifty genotype as well as perception of augmented body mass as in diabetes and obesity intermingled with malaria and typhoid fever [1, 2].

The contemporaneous interactive occurrence of health encumbrance, constraints and challenges in transition economies or populations per sociocultural-economic contexts provide for conceptual frameworks in sustainable development and improvement as well as understand risk factors to better design, formulate and implement optimum prevention and intervention strategies to harness co-morbidities in disease presentation. The syndemic concept propounded by medical anthropologists makes provision to prevent, treat and control comorbidities as synergistic health perturbations which contextually impact on the health of populations in the face of persistent social, economic and political inequities or inequalities. It is pertinent to provide research and systems of medical care to the potential beneficial application of syndemic care to patients with interactions

in infectious and non-infectious diseases [3].

Reemerging Communicable Diseases

Globally, the complex interplay between infectious and non-communicable diseases including several life changing factors have been increasing persistently and disproportionately, displaying an expansive untoward resultant impact on LMICs [4]. The population of Africa presents inimical and cryptic constraints and challenges with particular reference to the heightened encumbrance of infectious diseases and non-communicable diseases with accelerated progression in the continent [5]. For instance, Ebola and meningitis have combined to enhance the vulnerability of Africa to debilitating infectious diseases which are re-emerging [6]. The first index case of the deadly Ebola virus disease was reported in 2014 in Nigeria as introduced from Liberia by an infected male subject. The disease was initially detected in Sudan, Zaire and other East African countries in 1976, where more than 284 persons were infected, with a mortality rate exceeding 53 percent in Sudan and Zaire alone. Following the next discovery was in 1994 in Cote d'Ivoire insidiously self-infecting a female etiologist performing necropsy on a Tai Forest chimpanzee. The 2014 West African outbreak was the most expansive and deranging and intricately complex Ebola incident since the first report of the 1976 incident. The 2014 outbreak excoriated Guinea, Liberia, Mali, Nigeria, Senegal, and Sierra Leone with gross morbidity and mortality impacts. In 2015 and 2016, Lassa fever was a scourge in several Nigeria States. Nigeria, for instance, has demonstrated strong political will to stem the tide regarding these re-emerging infectious diseases. These diseases are seasonal and Nigeria tends to provide sustainable settings for improved and safer ambient for the population [6].

In addition, cerebrospinal meningitis, a disease producing inflammatory response to the brain and spinal cord linings re-emerged in Sokoto and Zamfara States of Nigeria, and infiltrated over fourteen other States with concomitant disability and death. Nigeria intends to budget an estimated \$1.1 billion for vaccination of 22 million persons in five Northern States against meningitis, and for all the 16 States affected as an expenditure of \$3.3 billion dollars for vaccination services.

Risk Factors

Infectious or communicable diseases frequently share risks or are in coexistence with non-infectious or non-communicable diseases with increased risk or excruciating consequences of each other and on the Society. These provide the impetus to rationalize the implementation of preventive, management and screening modalities among healthcare providers. Africa has a multifarious climate varying from a broad desert ambient to tropical rain forest which is susceptible to fertile and suitable milieu for a vast majority of disease vectors. Other factors include lack of research funding, ignorance of life history of vectors and accompanying disease life, internecine conflicts, overpopulation in endemic and erstwhile sterile areas, inadequate nutrition and food insecurity result in reduction of the viability of the immune system to fight reemerging infectious diseases. High-income countries have been able to harness or curb the SARS epidemic due to augmented immune system and other attributes [7].

Obesity with cigarette smoking has been evidenced to be detrimental to health and healthcare in high-income countries and obesity levels have accelerated globally in most populations [8, 9]. In 2013, a fifth of global adult population in high-income countries was estimated to have obesity of a body mass index, BMI of approximately 30kg/m² [10]. It was reported that both smoking and obesity severally or jointly contribute to low life expectancy differentials of the USA in comparison to European countries and to within country mortality rate disparities using variables, such as socioeconomic status [8, 11-13].

Notwithstanding widespread concerns in health-related risks and behavioural patterns, there is anecdotal information on persons or populations of diverse countries exposed to differential categories of risks. It is perspicuously expressed that to compare mortality and morbidity risks across countries from expressed behaviours may determine how characteristics of health systems and epidemiological features modulate or exacerbate health effects of risk-associated behaviours. These were depicted by means of an evaluation during 1971-2014 in the USA and Finland studying both current and previous cigarette smokers linked with extant and erstwhile obesity using representative samples to elucidate the cross-sectional disparities in mortality risks due to a combination of cigarette consumption and obesity. In 1990, the approximate midpoint of the investigation, the mortality risks from continuous smoking were nearly 55% greater in USA women than in Finnish women but indicated identical observations for male subjects in both countries. Mortality risks due to smoking were significantly elevated for female persons in the two countries with no corresponding increase in risks among male subjects. There was no marked disparity for mortality risks from obesity in both countries, while no remarkable trend was observed in both countries [14]. Although, country study or international comparative analyses may elucidate if health system and cohort behaviour modulate or exacerbate risks in combined smoking with

obesity, it is perspicuous that the USA and Finland study did not take in-depth consideration of the expansive pluralistic USA society that contradicts the almost homogenous Finnish climate with the former's distinct ethnic and racial disparities which are not clearly delineated in the latter which ought to be extrapolated to other contexts, such as elevated level of poverty, diet and nutrition in the USA among indigenous Americans, African Americans, Hispanics or Latinos and other immigrants from low socioeconomic background not supported by a preponderant social security system as obtainable in Finland.

Multifactorial risk models are extant which validly predict incident diabetes in specific adult populations [15, 16]. Valid application of these risk models in appropriate clinical settings adequately identified adults at increased risk of diabetes development for better preventive settings. Also, evaluation of diverse adult diabetes risk calculation techniques to predict the development of incident diabetes and pre-diabetes among a bi-racial, young adult population indicated that diabetes risk scores in middle-aged, racially homogenous adult community can be applied to younger adult populations with good specificity but resultant poor sensitivity. The results suggested greater diabetes risk for blacks for incident diabetes and pre-diabetes in comparison to whites with equivalent risk scores. The inclusion of race did not relate in higher predictive potentials; thus, future research becomes imperative for a more sensitive risk score to predict diabetes in the younger adult populations [17].

Elevated non-communicable comorbidity and multimorbidity were detected in tuberculosis patients predicted by differentials, whereby active tuberculosis was associated with defective immune surveillance and corresponding links with other infectious and non-communicable diseases, such as oncological diseases, alcohol consumption disorders, smoking, chronic lung diseases, cardiovascular disease, diabetes, depression and hypertension. Persons with chronic infectious diseases, such as tuberculosis and HIV/AIDS are more susceptible to comorbidity with non-communicable diseases [18]. Due to the rapid dissemination and exacerbation of chronic communicable and non-communicable diseases, there is extant expansive encumbrance on health and healthcare services.

In almost all human species with their organs and systems, obesity exacerbates morbidity and mortality etiologies due to its predictive multifarious debilitative impacts. Obesity adverts impairments on the immune system via diverse immune mediators with concomitant susceptibility to infections. Most obese people are more vulnerable than non-obese persons or normal persons to acquire and develop a variety of infections, such as nosocomial infections in postoperative infections and other confounding complications [19]. Obesity and diabetes are correlated with elevated odds of mortality due to invasive group A *Streptococcus*, and IGAS infections after adjusting for age group, gender, race and other underlying variables in comparison, respectively to normal weight and nondiabetic patients [20]. Obesity is strongly linked with elevated risks of type 2 diabetes, cardiovascular disease and other presenting chronic non-communicable disorders. This observation needs to be extrapolated in studies related to reemerging and emerging infectious diseases [6].

Interactions in vulnerable populations Prevalence estimates are well-documented for metabolic disorders for several populations but these are anecdotal in the Alaska population [12]. An investigation aggregated data from three Alaska Native study cohorts to

assess disparities in obesity prevalence and connectedness with cardiometabolic risk factors by sex [12]. It was revealed that cardiometabolic risk factors in female subjects were minimally associated with obesity, higher obesity and central adiposity than in male persons; and women presented elevated HDL-C and triglycerides than the men. Relative disposition to increased blood pressure, LDL-C and glucose were observed in men than in women. It is a suggestive instance that obesity prevalence among indigenous peoples in the circumpolar regions of Alaska, Canada and Greenland is a debilitating attribute and of major health challenge and constraint for sustainable living and lifestyle in these vulnerable populations [21, 22].

Latinos are vulnerable to elevated risk for obesity and type 2 diabetes mellitus. Although, there has been a paucity of available literature, it is perspicuous that technology interventions, properly designed and articulated information technology interventions are correlated with efficacious diabetes self-management per Latinos. There are few studies on the most feasible modalities on the discrete and unique sociocultural linguistic attributes which are amenable to the adoption, utilization and benefit among Latinos. Sustainable e-health programmes correlating frequency in communication, bidirectionality or feedback and multimodal delivery of the interventions correlate to the strategy. The utilization of community health workers has consistently improved type 2 diabetes outcomes in Latinos. The inclusion of community health workers in e-health interventions facilitates to dissipate the barriers encountered with the limitations in technology awareness and literacy with the corresponding improvement in patient activation, satisfaction, adherence and compliance. Also, purposeful directed approach or tailoring to fit their needs in these interventions tend to be increasingly beneficial for the improvement of patient activation. It is extremely feasible and important that tailoring is not merely linguistic translation but involves intervention to the Latinos with optimum pertinence to focus on educational language, literacy and acculturation contents contemporaneously with discrete and unique illness beliefs, norms, mores, customs and attitudinal disposition concerning type 2 diabetes in the Latino sociomedical concept and context in the community. Interventions require expansiveness beyond solitary participants via inculcating shared decision-making models of friends, family and other interests in the community [23].

The special patient populations with comorbid presentations require pertinent adjustments in their nutritional needs and care. Since several comorbidities correlated with type 2 diabetes mellitus are linked with micro- and macrovascular sequelae, it is crucial to extrapolate and to restrict diabetes care to merely glycaemic control but to, also, check for iron deficiency anaemia attributed to malaria [24].

Detection and Diagnosis

There is extant epidemiological disease transition in the African population with rising incidence of non-communicable diseases superimposed on a health system employing community-based modality for mostly cases of acute and chronic communicable diseases. The persistent emerging and reemerging novel pathogenic agents provide latitude for the manifestations of comorbidities due to interactions between communicable and non-communicable diseases [25]. The extant non-infectious and infectious disease intervention settings are susceptible to leverage for non-communicable disease intervention for diagnosis and care of acute and chronic diseases for veritable health and healthcare systems in vulnerable populations.

There has been a marked improvement in the life expectancy of HIV patients as a result of augmented access to antiretroviral therapy leading to encumbrance of non-communicable and chronic diseases [26]. It was demonstrated that chronic non-communicable disorders present negative correlations on the kinetics of CD4⁺ cells count in HIV subjects on antiretroviral therapy. It is suggested that integrated HIV-chronic non-infectious strategies enhance the harnessing or curbing of increasing encumbrance of chronic impairment. Studies have demonstrated relationships between detectable HIV viral load and non-communicable diseases in HIV-infected subjects on antiretroviral drugs in high income ambients, accompanied by elevated risk of comorbidity development but an investigation in South Africa depicted lack of association probably due to under-diagnosis of none: communicable diseases in the country at that particular period [27]. Also, it has been shown in Uganda that the encumbrance of non-communicable diseases among persons having HIV is highly unquantified, and necessitates early diagnosis and treatment of non-communicable diseases [28].

These make it imperative for an integrated HIV and primary care setting towards authentic monitoring and evaluation of non-communicable disorders in HIV-infected subjects [29].

Psychiatric disorders frequently coexist with other non-infectious diseases, and share several risk factors. Thus, mental health, welfare and wellbeing constitute the focus to mitigate the worldwide encumbrance of non-infectious diseases which involve environmental attributes and mental disorders [30]. The five-by-five approach to confront non-communicable diseases, taking into cognizance disease types which tend to comorbid or multimorbid involves cardiovascular diseases, diabetes, oncological or carcinogenic problems, chronic respiratory diseases, mental disorders and other mental derangements. The risk factors tend to cluster together and include tobacco consumption, unhealthy diet, deficient physical activity, prohibitive alcohol consumption, environmental attributes and risk factors [31]. Stringent focus on encompassing risk factors, and integration of treatment and care of mental perturbations and other non-communicable diseases are liable to induce improvement and sustainable progress in confronting these assaults, and ameliorating associated overlapping morbidity.

Discussion

The inextricably-linked complex epidemiological, clinical and biological interfaces of non-communicable chronic diseases, such as obesity and diabetes with re-emerging infections have restricted published and researched history. The resultant impact of obesity and diabetes on the immune system, whether jointly or severally, is fulminant and complex effecting incidence and severity of infections. Obesity and diabetes predominate in the pandemic of non-communicable diseases, non-communicable diseases currently exacerbating globally with debilitating impact in low- and middle-income countries, LMICs with special effect in select conurbations [32]. It is perspicuous that there is greater frequency, constraints and challenges to effectively tend to persons with diabetes and/or obesity particularly in the presence of opportunistic organisms.

One major constraint is that a vast majority of the data on the epidemiology of the interface between infectious and non-communicable diseases with socioeconomic factors emerge from developed countries, whereas the population at risk are in LMICs. Adequate prevention of infections in obesity and diabetes constitute

a vital objective. Inasmuch as it is well-nigh impossible to determine the encompassing morbidity and mortality, the extant evidence and data are ominous of a combined chronic and acute diseases as an exacerbating public health concern. The resultant premise is that the chronic inflammatory posture of diabetes and obesity results in debilitating immune responses with extant infections. Research, preventive, newfangled therapeutic strategies are required in a global scale, particularly in LMICs where there is vast emergence of the greatest risk coupled with least availability of detection, treatment and control; and especially in extant comorbidity that also involves cardiovascular diseases and hypertension [33]. The adverse sequelae of non-communicable diseases, such as diabetes and obesity may present deranging impacts on the global health and healthcare encumbrance of emerging and reemerging infectious diseases.

Conclusion

The coexistence of health and healthcare encumbrance in transition environments, such as vulnerable populations with particular reference to the unique sociocultural and economic contexts justifies conceptual modalities and paradigms for comprehensive harnessing or curbing of risk factors for improved empirical and theoretical design, prevention, intervention, implementation, monitoring and evaluation of feasible programmes. These will be pertinent measures to address co-occurrence, coexistence, comorbidity or syndemics of infectious and non-infectious diseases as health and environmental dilemma regarding social and economic imbalance in vulnerable populations.

References

1. Chrysanthus Chukwuma Sr, Tuomilehto J (1998) the 'thrifty' hypotheses: clinical and epidemiological significance for non-insulin-dependent diabetes mellitus and cardiovascular disease risk factors. *J Cardiovascular Risk* 5: 11-23.
2. Candib LM (2007) Obesity and diabetes in vulnerable populations: Reflections on proximal and distal causes. *Ann FAM Med* 5: 547-556.
3. Mendenhall E, Kohrt BA, Norris SA, Ndeti D, Prabhakaran D (2017) Non-communicable disease syndemics: Poverty, depression, and diabetes among low-income populations. *The Lancet* 389: 951-963.
4. Gowshall M, Taylor Robinson SD (2018) the increasing prevalence of non-communicable diseases in low-middle income countries: the view from Malawi. *Int J Gen Med* 11: 255-264.
5. Peter N (2015) the converging burdens of infectious and non-communicable diseases in rural-to-urban migrant sub-Saharan African populations: a focus on HIV/AIDS, tuberculosis and cardiometabolic diseases. *Tropical Diseases, Travel Medicine and Vaccines*, 1: 6.
6. Chrysanthus Chukwuma Sr (2018) Bioinformatics-base and Determinants of emerging and reemerging infectious diseases. *J Inf Dis Prev Med* 6: 2.
7. Knobler S, Mahmoud A, Lemon S, Mack A, Sivitz L, et al. (2004) Learning from SARS: Preparing for the Next Disease Outbreak: Workshop Summary. Washington, DC, National Academies Press.
8. Crimmins EM, Preston SH, Cohen B (2011) Explaining divergent levels of longevity in high-income countries. The National Academies Collection. Report funded by National Institutes of Health, Washington, DC: National Academic Press (US).
9. Finncan MM, Stevens GA, Cowan MJ, Danaei G, Lin JK, et al. (2011) National, regional and global trends in body-mass index since 1980: Systemic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *The Lancet* 377: 557-567.
10. Marie Ng, Michael K Freeman, Thomas D Fleming, Margaret Robinson, Laura Dwyer Lindgren (2014) Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA* 311: 183-192.
11. Pekka Martikainen, Jessica Ho, Samuel Preston, Irma T Elo (2013) the changing contribution of smoking to educational differences in life expectancy: indirect estimates for Finnish men and women from 1971 to 2010. *J Epidemiol & Community Health* 67: 219-224.
12. Hopkins SE, Austin MA, Metzger JS, Koller KR, Umans JC, et al (2015) Sex differences in obesity prevalence and cardiometabolic factors among Western Alaska Native people. *Nutr Metab Cardio Dis*, 25: 312-318.
13. Mehta NK, House JS, Elliott MR (2015) Dynamics of health behavior and socioeconomic differences in mortality in the USA. *J Epidemiol & Community Health* 69: 416-422.
14. Neil Mehta, Irma Elo, Sari Stenholm, Arpo Aromaa, Markku Heliövaara, et al. (2016) International differences in the risk of death from smoking and obesity: The case of the United States and Finland. *SSM – Population Health*, 3: 141-152.
15. Balkau B, Lange C, Fezeu L, Tichet J, de Lauzon Guillaing, et al. (2008) Predicting diabetes: clinical, biological, and genetic approaches: Data from the epidemiological study on the insulin resistance syndrome (DESIR). *Diabetes Care* 31: 2056-2061.
16. Kahn HS, Cheng YJ, Thompson TJ, Imperatore G, Gregg EW (2009) Two risk-scoring systems for predicting incident diabetes mellitus in U.S. adults age 45 to 64 years. *Ann Intern Med* 150: 741-751.
17. Benjamin D. Pollock, Tian Hu, Wei Chen, Emily W. Harville, Shengxu Li (2017) Utility of existing diabetes risk prediction tools for young black and white adults. Evidence from the Bogalusa Heart Study. *J Diab Complications* 31: 86-93.
18. Peltzer K (2018) Tuberculosis, non-communicable disease comorbidity and multimorbidity in public primary care patients in South Africa. *Afr J Prim Health Care Fam Med* 10: 1651.
19. Matthew E Falagas, Maria Kompoti (2006) Obesity and infection. *The Lancet* 6: 438-446.
20. Langley G, Hao Y, Pondo T, Miller L, Petit S, et al (2016) The impact of obesity and diabetes on the risk of disease and death due to invasive group A Streptococcus infections in adults. *Clin Infect Dis* 62: 845-852.
21. Risica PM, Schraer C, Ebbesson SO, Nobmann ED, Caballero B (2000) Overweight and obesity among Alaskan Eskimos of the Bering Straits region: the Alaska Siberia project. *Int J Obes Relat Metab Disord* 24: 939-944.
22. Bjerregard P, Jorgensen ME, Andersen S, Mulvad G, Borch Johnsen K, et al (2002) Decreasing overweight and central fat patterning with westernization among the Inuit in Greenland and Inuit migrants. *Int J Obes Relat Metab Disord* 26: 1503-1510.
23. Lopez L, Tan McGrory A, Horner G, Betancourt JR (2016) Eliminating disparities among Latinos with type 2 diabetes: Effective eHealth strategies. *J Diab Complications* 30: 554-560.
24. Viswanathan V, Krishnan D, Kalra S, Chawla R, Tiwaskar M, et al. (2019) Insights on medical nutrition therapy for type 2 diabetes mellitus: An Indian Perspective. *Advances in Therapy* 36: 520-547.

25. Osakunor DNM, Sengeh DM, Francisca Mutapi (2018) Confections and comorbidities in Africa health systems; at the interface of infectious and non-infectious diseases. PLoS ONE Negl Trop Dis 12: 0006711.
26. Tsegaye Melaku, Girma Mamo, Legese Chelkeba, Tesfahun Chanie (2019) Immunologic restoration of people living with human immunodeficiency virus on highly active anti-retroviral therapy in Ethiopia: The focus of chronic non-communicable disease co-morbidities.
27. Rodriguez Penny AT, Iudidello JE, Riggs PK, Doyle K, Ellis RJ, et al. (2013) Comorbidities in persons infected with HIV-increased burden with older age and negative effects on health-related quality of life. AIDS Patient Care STDs 27: 5-16.
28. Sheila Kansiime, Doris Mwesigire, Henry Mugerwa (2019) Prevalence of non-communicable diseases among HIV positive patients on antiretroviral therapy at joint clinical research centre, Lubowa, Uganda. PLoS ONE 14: 0221022.
29. George S, McGrath N and Oni T (2019) the association between a detectable HIV viral load and non-communicable diseases comorbidity in HIV positive adults on antiretroviral therapy in Western Cape, South Africa. BMC Infect Dis 19: 348.
30. WHO Global NCD Action Plan 2013-2020, World Health Organization, WHO 2013.
31. Skin DJ, Benjet C, Gureje O, Lund C, Scott KM, et al. (2019) Solutions for prevention and control of non-communicable diseases; Integrating mental health with other non-communicable diseases. BMJ 364: 1295.
32. Horton R (2013) Non-communicable diseases: 2015 to 2025. Lancet 381: 509-510.
33. Huttunen R, Syrjanen J (2013) Obesity and the risk and outcome of infection. Int J Obes 37: 333-340.
34. Fischer-Hoch SP, Mathews CE, McCormick JB (2013) Obesity, diabetes and pneumonia: the menacing interface of non-communicable and infectious diseases. Tropical Medicine & International Health, 18: 1510-1519.

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