

Extended Abstract

Decrypting gender frames of MorbiNet: Evidence from the Longitudinal Ageing Study in India (LASI), 2020

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Background and Rationale. With the dawn of epidemiological transition, insurgence of non-communicable diseases (NCDs) has been reported globally. India however, is clinched under a dual disease burden produced by receding communicable diseases rates and rising NCD levels. Recent estimates suggests that 56.5% of the total disease burden in India, is contributed by NCDs. NCDs in India have by far been studied in isolation, however recent studies report that NCDs often coexist. These coexisting diseases can be bifurcated into concordant or discordant combinations, resulting from shared or separate pathophysiologies, respectively. Coexistence of multiple health conditions in an individual, is termed as ‘multimorbidity’. In absence of any validated measure, a cut-off of two or more chronic conditions is accepted globally.

Multimorbidity is reported to present severe implications, in terms of poor quality of life, disability, increased healthcare utilisation, high economic burden, and reduced physical and mental competence. The World Health Organization (WHO) suggest that the implications posed by coexisting NCD burden is higher for those residing in the low-and middle-economies, like India. Existing literature suggests that multimorbidity burden in India started soaring in the past two decades. In addition to this, the age at onset of non-communicable morbidity is stated to be reduced, i.e., India is experiencing an expansion in the morbidity burden. Other studies report that non-communicable chronic diseases are reported to be quite prevalent among older adults, i.e., individuals in the age-group 45 years and above in India. A recent report from the Longitudinal Ageing Study in India (LASI), suggest that around 18 percent of the older adults (individuals 45 years and above) stated to be affected with non-communicable multimorbidity in India.

However, to the best of our knowledge, Indian evidence on multimorbidity for the entire country are inadequate. The studies done by far are based on smaller sub-groups of India’s population mostly deriving their data from healthcare set-up. Also, none of these studies focuses on exploring the associations and dynamics between the diseases, i.e., disease Therefore, the present study aims to explore which diseases are associated with each other and are accountable for intersecting disease clusters segregated by gender among older adults in India.

Data. The analysis is rested on 65,562 individuals aged 45 years or older, obtained from the Longitudinal Ageing Study in India (LASI), 2020.

Measures. The study utilized information on 16 self-reported diseases, namely asthma, cancer, chronic bronchitis, chronic renal failure, chronic obstructive pulmonary disease, diabetes,

gastrointestinal disorder, chronic heart disease, high cholesterol, hypertension, urinary incontinence, musculoskeletal disorder, neurological and psychiatric disorders, skin disease, stroke, and thyroid disease. This information was further used to compute a Chronic Disease Score (CDS); a $CDS \geq 2$ was defined as multimorbidity.

Statistical Analysis. A network analysis was employed to visualize the interplay between the non-communicable diseases, also known as, morbidity network (MorbiNet). MorbiNet was created specifically for multimorbid older adults. i.e. individuals who simultaneously have two or more chronic NCDs. To envision the disease network an edgelist was created on the basis on two distinctive approaches, namely “combination method” and “cluster method”.

In combination method the linkages between the selected morbidities were studied. All possible dyads and triads, i.e., combinations of two (${}^{16}C_2=120$) diseases were explored, respectively. All the results were substituted statistically significant associations or associative morbidities. All combination with a prevalence equal or higher than one percent were included in the edgelist. In the cluster method, a latent class analysis (LCA) was utilized to identify frequently occurring diseases clusters formed by the selected non-communicable diseases. The results from the combination analysis were grouped into one of the ‘n’ disease-groups (clusters) identified by the cluster method. Furthermore, quantitative measure of disease networks was calculated, namely 1) node degree centrality, and 2) node betweenness centrality. Analysis for identifying and visualizing MorbiNet was conducted using ‘sna’ and ‘igraph’ packages in RStudio version 1.1.463 (R Studio, Inc.), respectively.

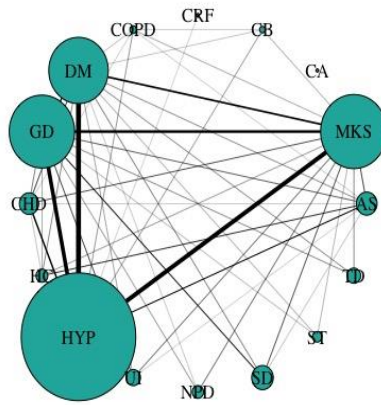
Key Findings. The study derived information in 18,518 multimorbid individuals from a dataset of 65,562 individuals aged 45 years or older from the first wave of the Longitudinal Ageing Study in India (LASI), 2020. The findings suggest that overall, hypertension (67.85%), musculoskeletal disorder (39.38%), gastrointestinal disorder (38.74%), diabetes (35.23%), and skin disease (12.83%) were the five most prevalence chronic diseases among older adults. In men, hypertension (62.80%), gastrointestinal disorder (39.27%), diabetes (35.94%), musculoskeletal disorder (32.41%) and skin disease (14.99%) were the five most prevalence chronic diseases. In women, hypertension (71.68%), musculoskeletal disorder (44.67%), gastrointestinal disorder (38.34%), diabetes (34.69%), and thyroid disease (11.34%) were the five most prevalence chronic diseases. Overall, hypertension had the highest number of edges (18), i.e., it was reported to be associated with 18 other chronic conditions. Similarly, in both genders, the condition with the highest number of edges was also hypertension (15 edges in men and 16 in women), i.e. hypertension was reported to be associated with 15 and 16 other chronic conditions in men and women, respectively. In men, hypertension along with gastrointestinal disorder were the two most important (central) diseases with betweenness centrality of 17.8% each. In women hypertension was the single most central disease, with betweenness centrality of 36%.

Conclusions. Evidence generated in the domain of multimorbidity have been few in the context of India, which could be the primary reason why the current healthcare infrastructure is based on a not so impressive “single disease model”. The present study is first attempt to explore the complexities of multiple non-communicable diseases among older adults. The findings provide empirical evidences which may assist policymakers in drafting and issuing improved guidelines to affectively and adequately manage the rising burden of multimorbidity among older adults in India.

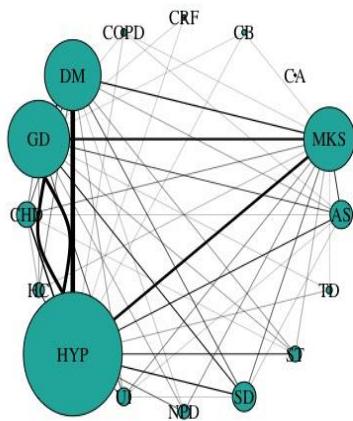
Table. Prevalence, number of edges, degree and betweenness centrality of diseases by gender and multimorbidity clusters in the population with ≥ 2 chronic conditions, Longitudinal Ageing Study in India (2020)

Chronic Disease	Prevalence			Number of edges (degree centrality)			Betweenness		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Asthma (AS)	12.28	14.30	10.75	9	8	6	3.77	1.40	0.40
Musculoskeletal Disorder (MKS)	39.38	32.41	44.67	13	13	13	17.10	11.80	11.20
Cancer (CA)	1.64	1.26	1.93	0	0	1	0.00	0.00	0.00
Chronic Bronchitis (CB)	3.47	2.94	3.87	4	3	5	0.00	0.00	0.00
Chronic Renal Failure (CRF)	1.94	2.54	1.49	1	2	2	0.00	0.00	0.00
Coronary Obstructive Pulmonary Disorder (COPD)	4.05	3.73	4.28	6	4	6	0.50	0.00	2.00
Diabetes Miletus (DM)	35.23	35.94	34.69	13	10	13	17.10	13.50	11.21
Gastrointestinal Disorder (GD)	38.74	39.27	38.34	11	15	10	10.65	17.80	2.75
Chronic Heart Disease (CHD)	11.46	12.96	10.33	7	7	7	0.85	0.60	1.04
High Cholesterol (HC)	7.01	7.28	6.81	5	5	5	0.00	0.00	0.00
Hypertension (HYP)	67.85	62.80	71.68	8	15	16	14.03	17.8	36.00
Urinary Incontinence (UI)	8.59	9.05	8.23	4	6	4	0.00	0.00	0.00
Neurological and Psychiatric Disorder (NPD)	6.81	7.20	6.51	3	4	5	0.00	0.00	0.00
Skin Diseases (SD)	12.83	14.99	11.19	4	6	6	0.00	0.00	0.14
Stroke (ST)	5.63	7.91	3.91	3	5	3	0.00	0.00	0.00
Thyroid Disease (TD)	8.10	3.82	11.34	3	3	8	0.00	0.00	1.24

A.



B.



C.

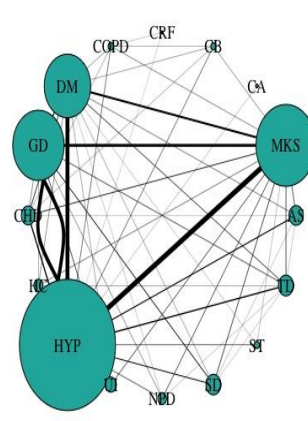


Figure. (A) Multimorbidity networks among older adult population (B) Multimorbidity networks among older men population (C) Multimorbidity networks among older women population, Longitudinal Ageing Study in India (LASI), 2020