

# Prevalence of multimorbidity among adults attending primary health care centres in Qatar: A retrospective cross-sectional study

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## ABSTRACT

**Context:** Multimorbidity (MM) is a global concern following the increase in life expectancy, the conquering of major infectious diseases, and the advances in the management of chronic illnesses. It places a substantial burden on patients and healthcare systems. **Aims:** This study aims to describe the prevalence and pattern of MM in adults among primary healthcare users in Qatar. **Settings and Design:** A retrospective cross-sectional study design. **Methods and Material:** Data were extracted from the electronic health records of patients aged 18 years and above who registered for care with 27 primary health centres in Qatar from 1<sup>st</sup> January 2017 to 30<sup>th</sup> June 2020. The distribution of MM among age groups, gender and nationality was analysed. **Results:** In the study population of 7,96,427, the prevalence of MM was found to be 22.1%. MM was more prevalent in females (51.2%) than males (48.8%). The prevalence of MM showed an increasing trend with increasing age, with a peak of 25.8% found in the 46-55 age group. Qatari nationals accounted for 32.7% of MM, Southeast Asians for 28.3%, North Africans for 16.7% and individuals from other Middle Eastern countries for 14.1%. The five most common long-term chronic conditions were type-2 diabetes mellitus, hypertension, dyslipidaemia, obesity and eczema, with the first three being the most prevalent disease clusters. **Conclusions:** Our findings confirm that MM is common in Qatar's primary care centres. While the prevalence of MM was found to increase with increasing age, the largest proportion of patients with MM were those aged 46-55 years. This information adds to the available data on MM and directs health policymakers towards tailoring the management for the same.

**Keywords:** Comorbidity, multi-morbidity, prevalence, primary health care, Qatar

## Introduction

Multimorbidity (MM) has been defined as the “presence of several co-occurring long-term conditions being related or not,

in a given patient”.<sup>[1]</sup> MM has become more prevalent over recent years and along with an ageing population contribute to a significant global health challenge.<sup>[2]</sup> It has become the norm in primary care, especially as primary care physicians take care of people from “the cradle to the grave”. The care for MM requires a varied knowledge base, patient-centred approach and effective coordination of existing services. Patients with MM are at higher risk of polypharmacy, poor compliance, adverse drug events, frequent and complex interaction with healthcare services,

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**Received:** 11-12-2020

**Revised:** 02-02-2021

**Accepted:** 03-02-2021

**Published:** 31-05-2021

### Access this article online

#### Quick Response Code:



**Website:**  
www.jfmpc.com

**DOI:**  
10.4103/jfmpc.jfmpc\_2446\_20

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**How to cite this article:** Mohideen FS, Rajkumar Honest PC, Syed MA, David KV, Abdulmajeed J, Ramireddy N. Prevalence of multimorbidity among adults attending primary health care centres in Qatar: A retrospective cross-sectional study. J Family Med Prim Care 2021;10:1823-8.

decreased patient satisfaction, increased mortality and reduced functional status.<sup>[3]</sup> In most areas of the world, many aspects of the healthcare system are designed around a single disease condition or body system. This has resulted in the emphasis on single chronic disease programs or clinics and sub-specialisation. A person with MM would have to do multiple visits in such healthcare systems resulting in risks to the safety of the patient, increasing costs and duplication of services.<sup>[4,5]</sup>

MM is distinct from comorbidity. These terms have sometimes been misleadingly used interchangeably. Alvan Feinstein coined the word comorbidity to refer to any additional clinical condition that may occur during the clinical course of a patient under a study for a single disease entity.<sup>[6]</sup> However, the term MM is used in situations where no index disease entity is under consideration. Notably, the concept of comorbidity is more relevant to specialised care in particular areas of expertise, whereas MM is more applicable to primary care and family practice settings.

Several studies from different countries have reported varied prevalence of MM. The global estimates vary from 14% to 90% with the highest prevalence in developed countries.<sup>[7,8]</sup> The estimated prevalence of MM in low- and middle-income countries (LMIC) range from 14 to 68%.<sup>[9-12]</sup> The widely diverse estimates of the magnitude of MM prevalence were due to the differences in the definition of MM and methodological variability.<sup>[13]</sup>

In the state of Qatar, chronic diseases like diabetes mellitus, ischemic heart disease, stroke, chronic kidney diseases are part of the top 10 leading causes of mortality.<sup>[14]</sup> The Ministry of Public Health of Qatar had rolled out a National Health Strategy (NHS) 2018 to 2022 to improve the health of the population. The NHS had identified seven priority populations for intensively addressing their health needs. One of the priority populations are people living with multiple chronic conditions.<sup>[15]</sup> The prevalence of MM among the population utilising the primary health care services of Qatar has not yet been documented. Zidan *et al.* had documented the presence of medication-related burden among patients with chronic disease.<sup>[16]</sup> This study outlined the presence of MM among patients with poor adherence to medications. The prevalence of four specific non-communicable disease clusters in the primary care settings of Qatar has been reported by Syed MA *et al.*, recently.<sup>[17]</sup> Our study was done with the aim of adding to the epidemiological data on MM.

In view of the integral role of primary care in the management of patients with chronic conditions and primary care being the major care provider for the population in Qatar, it is essential to examine the prevalence of MM. Moreover, this would address one of the steps in the National Health Strategy 2022 of Qatar. Knowing the extent of the burden of MM would aid the policymakers in focusing on interventions to prevent MM, educate healthcare providers in applying clinical guidelines to people with MM and invest in primary healthcare systems that would provide adequate coordination and continuity of care to people with MM. This

study seeks to explore the prevalence and pattern of MM among primary healthcare users in Qatar.

## Subjects and Methods

### Study setting

Qatar is a country located in Western Asia, occupying the small Qatar Peninsula on the Northeastern coast of the Arabian Peninsula. It is classified by the United Nations as a country of very high human development, having the third-highest human development index (HDI) in the Arab world.<sup>[18]</sup> Qatar's population is estimated at 2,717,360.<sup>[19]</sup> The Primary Health Care Corporation (PHCC)<sup>[20]</sup> is a government-funded organisation that delivers comprehensive, integrated and coordinated person-centred healthcare services to the community by focusing on disease prevention, healthy lifestyles and wellness. It operates 27 health centres (accredited by Accreditation Canada International)<sup>[21]</sup> across Qatar, delivering community-based primary care services to Qatar's population.

### Study population and data collection

The study design was retrospective and cross-sectional. The study was conducted using anonymised administrative, electronic health record data of patients who had registered in the 27 primary health centres of the State of Qatar. The study population included both Qataris and non-Qataris registered at all the 27 PHCC healthcentres, aged  $\geq 18$  years and have visited a primary health care centre at least once between 1<sup>st</sup> January 2017 and 30<sup>th</sup> June 2020. Demographics related to age, nationality, gender and diagnosis data were extracted from the electronic medical records for the defined population. Data were obtained from the Chronic Diseases Database maintained by PHCC. The database is a repository of patient diagnoses extracted as SNOMED-CT codes<sup>[22]</sup> or ICD- 10 (International Classification of Diseases -10)<sup>[23]</sup> codes from the CERNER electronic medical records system, which are grouped under the respective diagnosis categories. A total of 31 chronic diseases were considered in this study [see supplementary file].

### Data analysis

All data were analysed using the software STATA version 15.1.<sup>[24]</sup> Basic descriptive statistics were used to analyse the population characteristics: age, gender, nationality and disease clusters (see supplementary file for classification). Crude prevalence rates for MM clusters that were classified as at least two, three, four, five and more than six chronic diseases by age, gender and nationality were calculated. The top five MM clusters were identified for each of the population characteristics. In addition, the prevalence rates of the top 25 MM clusters were calculated.

### Ethical considerations

The study presented a minimal risk of harm to its subjects, and the data collected for it were anonymised. The study was conducted with integrity according to the accepted ethical principles and was approved by the PHCC Independent Ethics

Committee (PHCC/DCR/2020/03/027). There was no conflict of interest.

## Results

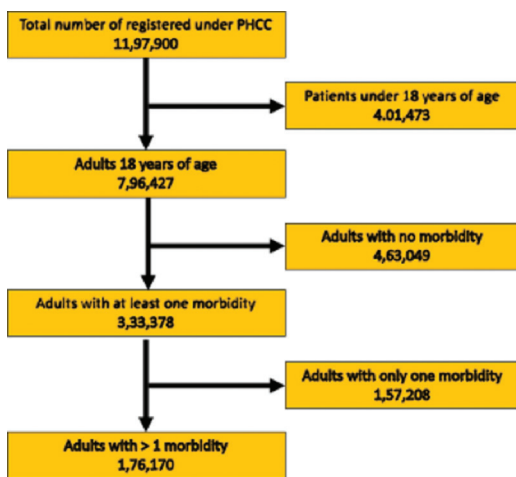
### Population overview

A total of 7,96,427 individuals aged 18 and above were eligible for inclusion in the study [Figure 1]. The mean age of the population studied was 43.58 +/- 9.19 years (range: 18 to 116 years). The prevalence of MM increases with age from 4.9% to 25.8% till 55 years and then drops to 11.7% at the age of more than 65 years. The distribution was marginally more in females (90,217, 51.2%) than males (85,953, 48.8%) males. [Table 1]

The MM distribution between Qatari and non-Qatari sections of the population reflects the population distribution in the general population, which has more expatriate population than Qatari nationals. A table in the supplementary section further subdivides the expatriate population according to the International Organization for Standardization's country codes.<sup>[25]</sup>

Among these 19.7% (1,57,208) had one morbidity while 41.9% (3,33,378) had more than one morbidity. The prevalence of MM was 22.1% (1,76,170). The mean number of morbidities among individuals who had any disease was 2.6 (SD = 1.53) and 3.19 (SD = 1.48) among those with MM. We stratified the prevalence based on the number of morbidities each patient has and we found that the maximum number of morbidities in a person (43%) was two and, the prevalence of MM reduced as the number of morbidities increased to five or more (8%). The top five common conditions were hypertension (62.61%), type-1 diabetes mellitus (58, 76%), eczema (53.51%), dyslipidaemia (52.91%) and obesity (33.36%), respectively. [Table 2]

When the data were stratified based on gender, nationality and age categories, it was noted that individuals with two conditions accounted for the highest prevalence and individuals with more



**Figure 1:** Inclusion flowchart for the final sample of adult patients with active registration with the Primary Health Care Corporation (PHCC) during the data extraction period

than five accounting for the lowest prevalence of MM. [Figure 2]. Figure 3 shows the trend of the prevalence of MM stratified by age group and gender.

When we ranked the top five MM clusters based on the number of morbidities per person, lifestyle illnesses like type 2 diabetes mellitus, hypertension, dyslipidaemia, obesity and eczema topped the clusters. [Table 3] We found the same diseases form the top 25 multimorbid clusters in the study population irrespective of the number of morbidities per person. However, we noticed that most of the population belong to the dual-morbidity clusters. [see the table in supplementary file]

## Discussion

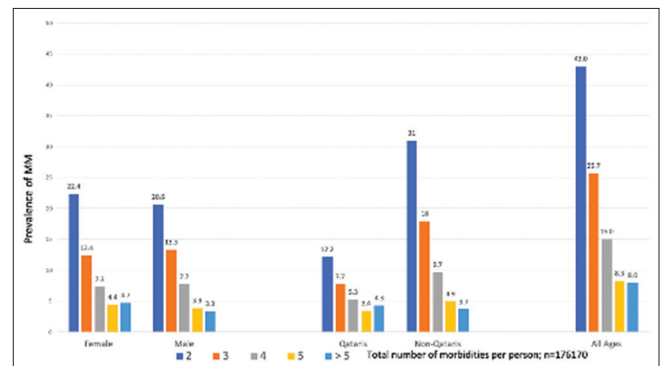
To our knowledge, this is the first study documenting the prevalence of MM in both Qatari and non-Qatari populations registered in publicly funded primary healthcare settings in Qatar.

**Table 1: Distribution of study population with MM (n=1,76,170) with age, gender and number of morbidities (%)**

	Gender	Nationality	
Female	90,217 (51.2)	Qatari	57,613 (32.7)
Male	85,953 (48.8)	Non-Qatari	1,18,557 (67.3)
Age category, years		Number of morbidities	
18-25	8549 (4.9)	2	75,808 (43.0)
26-35	23997 (13.6)	3	45,246 (25.7)
36-45	40571 (23.0)	4	26,464 (15.0)
46-55	45430 (25.8)	5	14,599 (8.3)
56-65	36968 (21.0)	>5	14,053 (8.0)
>65	20655 (11.7)		

**Table 2: Prevalence of the top five morbidities**

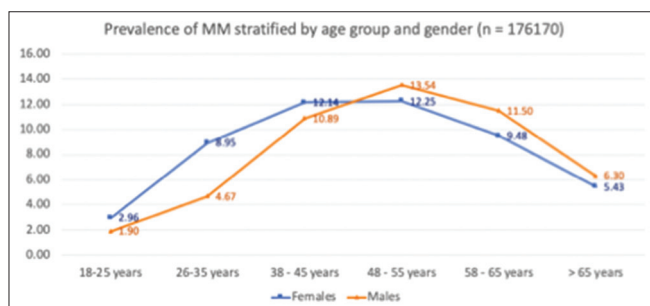
Morbidity	n	%
Hypertension (HTN)	1,10,304	62.61%
Diabetes Mellitus, Type 2 (DM2)	1,03,517	58.76%
Eczema (ECZM)	94,263	53.51%
Dyslipidaemia (DLIP)	93,220	52.91%
Obesity (OBS)	58,765	33.36%



**Figure 2:** Prevalence of multimorbidity stratified by the total number of chronic diseases per person, age, gender and nationality

**Table 3: The five common MM clusters stratified based on the number of morbidities per person**

Most frequent clusters (n)	Number of morbidities per person			
	2	3	4	5
Rank 1	DM2- HTN (6525)	DM2- HTN- DLIP (9704)	DM2- HTN- DLIP- ECZM (2224)	DM2- HTN- DLIP- OSARTH- ECZM (731)
Rank 2	DM2- DLIP (6084)	DM2- DLIP- ECZM (1134)	DM2- HTN- OBS- DLIP (1588)	DM2- HTN- OBS- DLIP- ECZM (544)
Rank 3	HTN- DLIP (4778)	DM2- HTN- IHD (1013)	DM2- HTN- IHD- DLIP (1501)	DM2- HTN- OBS- DLIP- OSARTH (386)
Rank 4	OBS- ECZM (3298)	HTN- DLIP- ECZM (993)	DM2- HTN- DLIP- OSARTH (1498)	DM2- THY- HTN- DLIP- ECZM (368)
Rank 5	ASTH- ECZM (2824)	DM2- OBS- DLIP (954)	DM2- THY- HTN- DLIP (1163)	DM2- HTN- IHD- DLIP- ECZM (366)



**Figure 3:** Prevalence of multimorbidity stratified by age group and gender

The prevalence of MM in the study population was noted to be 22.1%. This highlights the burden of MM in Qatar, across all adults and not just the elderly population. However, MM was not gender predominant, and those with only two morbidities made up a substantial proportion of all patients with MM. The prevalence of MM reported in our study was comparable to MM reported in primary care in Singapore (26.2%),<sup>[26]</sup> India (24%), Ghana (23%) and China (22%).<sup>[12,27]</sup> In contrast, primary care practices in developed countries like Canada (53.3%) and the United Kingdom (58%) documented a higher prevalence of MM.<sup>[28,29]</sup>

In addition, our data revealed MM among younger adults of the age group 46–55 years among both genders (12.24% females and 13.53% in males). The proportion of females with MM was more (15.1%) in a much younger age group of 36–45 years. This suggests that primary care physicians would need to intensify preventive care practices in younger patients. The presence of allergic illnesses such as asthma and eczema are also high in young adults. A low prevalence of psychiatric illness in our sample of patients with MM was observed. This is likely as psychiatric illness such as depression and anxiety are under-diagnosed in primary care.

A study conducted in the peri-urban slums of Delhi, India amongst the frail elderly for multimorbidity and polypharmacy showed that MM is higher amongst the 60–65-year-old (57%) people and decreased amongst the 65–75-year-old (18%) people and then showed an increase of 24% again amongst the late elderly.<sup>[30]</sup> However, in this study, a wider age group was considered, and the highest prevalence of MM was found among the 46–55 years age group (25.8%) with a majority of the patients (43%) accounting for only two morbidities. The prevalence of MM gradually declined in the 56–65 age

group (21.0%) and the above 65 age group (11.7%). The number of morbidities increased with age, and the highest number of morbidity (those with only six or more) was noted in patients above the age of 65.

A study conducted by Alharbi BA *et al.*<sup>[31]</sup> in a primary health care setting in Riyadh, Saudi Arabia showed that the common chronic illnesses among the elderly were cardiovascular diseases, dyslipidaemia, diabetes, diseases of the genitourinary system and arthritis. Most of the elderly (65 years and above) had more than three chronic diseases. In comparison, this study showed that most of the elderly population (above 65 years) had six or more morbidities with type 2 diabetes, hypertension, obesity, dyslipidaemia, osteoarthritis and eczema being the commonest disease cluster. Those between 56–65 years had at least three morbidities with type-2 diabetes, hypertension and dyslipidaemia being the commonest disease clusters amongst this age group.

These disease clusters of co-existing illnesses could be because of simple co-occurrence or causally relation. It remains unknown whether there are biological, environmental or behavioural factors that predict the risks of some types of multimorbidity independently of factors that alter the risk of the individual component conditions. The identification of any such factors, and the assessment of the likelihood of causality, requires data from future prospective observational studies.

Large components of the health system are designed around single conditions or body systems. Thus, the focus of treating one disease takes predominance over treating a person with multiple diseases. We need to refocus the healthcare system to plan and manage persons living with MM adequately. This focus on single diseases also extends to the training of doctors, particularly those working in hospitals where sub-specialisation is now common, leaving out the coordination of care for patients with multiple chronic conditions. Such evidence affirms the need for patient-centred care as an alternative to disease-centred care.

### Strengths and Limitations

The strengths of this study include a large sample from a primary care practice in Qatar. The data derived from the electronic health records is a limitation as the diagnosis of chronic care depends on what had been documented during the primary care visit by the physician. Future research would glean more information when done prospectively.

## Conclusion

The study takes a step forward in documenting the burden of MM in primary care practices in Qatar so that an integrated set of responses around multiple chronic diseases can be planned. Although not nationally representative, this study is suggestive of a higher prevalence of MM among the 46–55 age group, females, and in Qatari, South Asian, North African and Middle East nationalities. Because MM is associated with a significantly higher risk for death, increased cost of treatment and more challenges to patient safety, it is crucial to improve the health professionals' understanding of the management of multiple chronic conditions simultaneously.

## Key Messages and recommendations

This retrospective cross-sectional study revealed that the prevalence of MM in Qatar's primary care practice population is 22.1%. Type-2 diabetes mellitus, hypertension, dyslipidaemia, obesity and eczema are the top disease clusters. We recommend that healthcare professionals be oriented to manage a person with MM in an integrated manner to effectively manage multiple chronic diseases in a person.

## Acknowledgements

The authors acknowledge the support and encouragement of their health centre's manager and the Primary Health Care Corporation's Clinical Research Department.

## Authors' contribution

FSM, PCRH, KVD & JA conceived the idea, designed, and conducted the study to its completion. In addition to the above four authors, MAS & NR were involved in data extraction, analysis, preparation of the manuscript and in reviewing it.

**Key Messages:** This retrospective cross-sectional study revealed that the prevalence of multimorbidity in Qatar's primary care practice population is 22.1%. Type-2 diabetes mellitus, hypertension, dyslipidaemia, obesity and eczema are the top disease clusters.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

- Mercer SW, Salisbury C, Fortin M, editors. ABC of Multimorbidity. Oxford: John Wiley & Sons; 2014.
- World Health Organization. Global Status Report on Noncommunicable Diseases 2010. Geneva, Switzerland: World Health Organization; 2011.
- Multimorbidity: Technical Series on Safer Primary Care. Geneva: World Health Organization; 2016.
- Fortin M, Lapointe L, Hudon C, Vanasse A, Ntetu AL, Maltais D. Multimorbidity and quality of life in primary care: A systematic review. *Health Qual Life Outcomes* 2004;2:51.
- Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: A cross-sectional study. *Lancet* 2012;380:37-43.
- Feinstein A. The pre-therapeutic classification of comorbidity in chronic disease. *J Chron Dis* 1970;23:455-68.
- Garin N, Koyanagi A, Chatterji S, Tyrovolas S, Olaya B, Leonardi M, *et al.* Global multimorbidity patterns: A cross-sectional, population-based, Multi-Country study. *J Gerontol A Biol Sci Med Sci* 2016;71:205-14.
- Oni T, McGrath N, BeLue R, Roderick P, Colagiuri S, May CR, *et al.* Chronic diseases and multimorbidity-A conceptual modification to the WHO ICCM model for countries in health transition. *BMC Public Health* 2014;14:575.
- Wang SB, D'Arcy C, Yu YQ, Li B, Liu YW, Tao YC, *et al.* Prevalence and patterns of multimorbidity in north-eastern China: A cross-sectional study. *Public Health* 2015;129:1539-46.
- Nunes BP, Batista SR, de Andrade FB, de Souza Junior PR, Lima-Costa MF, Facchini LA. Multimorbidity: The Brazilian longitudinal study of aging (ELSI-Brazil). *Rev Saude Publica* 2018;52(Suppl 2):10s.
- Lalkhen H, Mash R. Multimorbidity in non-communicable diseases in South African primary healthcare. *S Afr Med J* 2015;105:134-8.
- Nimako BA, Baiden F, Sackey SO, Binka F. Multimorbidity of chronic diseases among adult patients presenting to an inner-city clinic in Ghana. *Global Health* 2013;9:61.
- Eyowas FA, Schneider M, Yirdaw BA, Getahun FA. Multimorbidity of chronic non-communicable diseases and its models of care in low- and middle-income countries: A scoping review protocol. *BMJ Open* 2019;9:e033320.
- GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2020;396:1204-22.
- National Health Strategy 2018-2022 [Internet]. www.moph.gov.qa. 2018 [cited 2020 Nov 08]. Available from: <https://www.moph.gov.qa/Style%20Library/MOPH/Files/strategies/National%20Health%20Strategy%202018%20-%202022/NHS%20EN.pdf>.
- Zidan A, Awaisu A, El-Hajj MS, Al-Abdulla SA, Figueroa DC, Kheir N. Medication-related burden among patients with chronic disease conditions: Perspectives of patients attending non-communicable disease clinics in a primary healthcare setting in Qatar. *Pharmacy (Basel)* 2018;6:85.
- Syed MA, Alnuaimi AS, Zainel AJ, Qotba HA. Prevalence of non-communicable diseases by age, gender and nationality in publicly funded primary care settings in Qatar. *BMJ Nutr Prev Health* 2019;2:20-9.
- 2019 Human Development Index Ranking | Human Development Reports [Internet]. Hdr.undp.org. 2019 [cited 2020 Nov 08]. Available from: <http://hdr.undp.org/en/content/2019-human-development-index-ranking>.
- Monthly Figures on Total Population Monthly Figures on Total Population. (2020). Retrieved 23<sup>rd</sup> November 2020. Available from: <https://www.psa.gov.qa/en/statistics1/StatisticsSite/pages/population.aspx>.
- PHCC Homepage [Internet]. Phcc.gov.qa. 2020 [cited 2020

- Nov 27]. Available from: <https://www.phcc.gov.qa/>.
21. Accreditation Canada-Healthcare Accreditation Body [Internet]. Accreditation Canada. 2020 [cited 2020 Nov 08]. Available from: <https://accreditation.ca/>.
  22. [Internet]. SNOMED. 2020 [cited 2020 Dec 04]. Available from: <https://www.snomed.org/snomed-ct/five-step-briefing>.
  23. World Health Organization. The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines. Geneva: World Health Organization, 1992.
  24. StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC.
  25. ISO 3166 Country codes published by the ISO 3166 Maintenance Agency, International Organization for Standardization, Geneva, Switzerland. Available from: <https://www.iso.org/publication/PUB500001.html>.
  26. Low LL, Kwan YH, Ko MS, Yeam CT, Lee VS, Tan WB, *et al.* Epidemiologic characteristics of multimorbidity and sociodemographic factors associated with multimorbidity in a rapidly aging Asian Country. *JAMA Netw Open* 2019;2:e1915245. doi: 10.1001/jamanetworkopen.2019.15245.
  27. Singh K, Patel SA, Biswas S, Shivashankar R, Kondal D, Ajay VS, *et al.* Multimorbidity in South Asian adults: Prevalence, risk factors and mortality. *J Public Health (Oxf)* 2019;41:80-9.
  28. Nicholson K, Terry AL, Fortin M, Williamson T, Bauer M, Thind A. Prevalence, characteristics, and patterns of patients with multimorbidity in primary care: A retrospective cohort analysis in Canada. *Br J Gen Pract* 2019;69:e647-56.
  29. Salisbury C, Johnson L, Purdy S, Valderas JM, Montgomery AA. Epidemiology and impact of multimorbidity in primary care: A retrospective cohort study. *Br J Gen Pract* 2011;61:e12-21.
  30. Panda M, Pathak R, Islam F, Agarwalla R, Singh V, Singh F. Interplay of multimorbidity and polypharmacy on a community-dwelling frail elderly cohort in the peri-urban slums of Delhi, India. *J Family Med Prim Care* 2020;9:1647-55.
  31. Alharbi BA, Masud N, Alajlan FA, Alkhanein NI, Alzahrani FT, Almajed ZM, *et al.* Association of elderly age and chronic illnesses: Role of gender as a risk factor. *J Family Med Prim Care* 2020;9:1684-90.

## Supplementary file

### Title of the article:

Prevalence of multimorbidity among adults attending primary healthcare centres in Qatar: A retrospective cross-sectional study

**Table 1: Prevalence of the morbidities chosen to report (n, %)**

Hypertension (HTN) 1,10,304 (62.61%)	Diabetes mellitus, Type 2 (DM2) 1,03,517 (58.76%)	Eczema (ECZM) 94,263 (53.51%)
Dyslipidaemia (DLIP) 93,220 (52.91%)	Obesity (OBS) 58,765 (33.36%)	Thyroid disorders (THY) 47,612 (27.03%)
Asthma (ASTH) 43,630 (24.77%)	Osteoarthritis (OSARTH) 36,092 (20.49%)	Anxiety (ANX) 22,152 (12.57%)
Migraine (MIGR) 19,896 (11.29%)	Ischemic Heart Disease (IHD) 19,623 (11.14%)	Cancer, any (Cancer) 9,996 (5.67%)
Psoriasis (PSORI) 9,923 (5.63%)	Chronic kidney disease (CKD) 9,615 (5.46%)	Stroke (STR) 4,860 (2.76%)
Viral hepatitis, any (VHEP) 4,060 (2.30%)	Chronic obstructive pulmonary disease (COPD) 4,025 (2.28%)	Diabetes Mellitus, Type-1 (DM1) 3,955 (2.24%)
Tobacco dependence (SMOK) 3,947 (2.24%)	Atrial fibrillation (AFIB) 3,935 (2.23%)	Congestive heart failure (CHF) 821 (2.17%)
Epilepsy (EPIL) 3,773 (2.14%)	Rheumatoid arthritis (RHARTH) 2,954 (1.68%)	Peripheral vascular disease (PVD) 1,665 (0.95%)
Schizophrenia (SCHIZ) 1,198 (0.68%)	Dementia (DEMNT) 1,150 (0.65%)	Parkinson's disease (PRKIN) 607 (0.34%)
Alzheimer's disease (ALZ) 459 (0.26%)	Depression (DEPR) 330 (0.19%)	Cystic fibrosis (CYFIB) 249 (0.14%)
Human Immunodeficiency virus infection (HIV) 80 (0.05%)		

**Table 2: Distribution of the people with MM based on nationality**

	Number	% of X	% of N
Qatar	57,613	7.23%	32.7%
South Asia	49,851	6.26%	28.3%
Northern Africa	29,459	3.70%	16.7%
Middle East	24,788	3.11%	14.1%
South-East Asia	9,099	1.14%	5.16%
Eastern Africa	1,597	0.20%	0.91%
North America	1,178	0.15%	0.67%
Northern Europe	916	0.12%	0.52%
Western Africa	445	0.06%	0.25%
Southern Europe	235	0.03%	0.13%
Western Europe	180	0.023%	0.10%
Western Asia	161	0.02%	0.09%
Eastern Europe	148	0.02%	0.08%
Oceania	138	0.02%	0.08%
Southern Africa	132	0.02%	0.07%
South America	82	0.01%	0.047%
East Asia	40	0.005%	0.023%
Middle Africa	29	0.004%	0.016%
Central America	27	0.003%	0.015%
The Caribbean	24	0.003%	0.014%
Central Asia	23	0.003%	0.013%

**Table 3: The five common MM clusters stratified based on the number of morbidities per person**

		All ages	18-25 years	26-35 years	36-45 years	46-55 years	56-65 years	>65 years
Mean number of morbidities per person (in all adults with morbidity, n=333378)	F	2.15	1.39	1.49	1.81	2.46	3.45	4.53
	M	2.17	1.35	1.45	1.77	2.29	2.93	3.93
Prevalence of MM (in all adults with MM, n=176170)	F	51.2	60.9	65.7	52.7	47.5	45.2	46.3
	M	48.8	39.1	34.3	47.3	52.5	54.8	53.7

**Table 4: Top 25 Morbidity clusters among all the adults registered under PHCC (X=total population (3,33,378); N=population with MM (1,75,170))**

	Number (n)	% (n/X)	% (n/N)
DM2- HTN- DLIP	9,704	1.2%	5.5%
DM2- HTN	6,525	0.8%	3.7%
DM2- DLIP	6,084	0.8%	3.5%
HTN- DLIP	4,778	0.6%	2.7%
OBS- ECZM	3,298	0.4%	1.9%
ASTH- ECZM	2,824	0.4%	1.6%
THY- ECZM	2,570	0.3%	1.5%
HTN- ECZM	2,516	0.3%	1.4%
DM2- HTN- DLIP- ECZM	2,224	0.3%	1.3%
DLIP- ECZM	2,129	0.3%	1.2%
THY- OBS	2,126	0.3%	1.2%
DM2- OBS	1,684	0.2%	1.0%
DM2- ECZM	1,649	0.2%	0.9%
OBS- DLIP	1,644	0.2%	0.9%
DM2- HTN- OBS- DLIP	1,588	0.2%	0.9%
DM2- HTN- IHD- DLIP	1,501	0.2%	0.9%
DM2- HTN- DLIP- OSARTH	1,498	0.2%	0.9%
THY- DLIP	1,404	0.2%	0.8%
OBS- ASTH	1,388	0.2%	0.8%
HTN- OBS	1,367	0.2%	0.8%
MIGR- ECZM	1,306	0.2%	0.7%
DM2- THY	1,245	0.2%	0.7%
OSARTH- ECZM	1,193	0.1%	0.7%
DM2- THY- HTN- DLIP	1,163	0.1%	0.7%
DM2- DLIP- ECZM	1,134	0.1%	0.6%



**Table 5: Morbidity clusters-List of top five disease clusters stratified based on age groups**

18-25 years, n=30,999		26-35 years, n=74,138	
ASTH- ECZM	789	OBS- ECZM	1,250
OBS- ECZM	778	THY- ECZM	1,136
OBS- ASTH	420	ASTH- ECZM	943
THY- ECZM	357	THY- OBS	890
THY- OBS	272	MIGR- ECZM	591
36-45 years, n=88,715		46-55 years, n=70,655	
DM2- DLIP	1,871	DM2- HTN- DLIP	3,360
DM2- HTN	1,434	DM2- HTN	2,412
DM2- HTN- DLIP	1,344	DM2- DLIP	2,342
HTN- DLIP	1,207	HTN- DLIP	1,764
OBS- ECZM	934	HTN- ECZM	805
56-65 years, n=46,008		Above 65 years, n=22,863	
DM2- HTN- DLIP	3,486	DM2- HTN- DLIP	1,343
DM2- HTN	1,747	DM2- HTN	636
DM2- DLIP	1,226	DM2-HTN-DLIP- OSARTH	518
HTN- DLIP	1,202	DM2- HTN- DLIP- ECZM	378
DM2- HTN- DLIP- ECZM	843	DM2- HTN- IHD- DLIP	366

**Table 6: Morbidity Clusters-Top five clusters in various age groups**

18-25 years; n=30999		26-35 years; n=74138	
ASTH- ECZM	789	OBS- ECZM	1,250
OBS- ECZM	778	THY- ECZM	1,136
OBS- ASTH	420	ASTH- ECZM	943
THY- ECZM	357	THY- OBS	890
THY- OBS	272	MIGR- ECZM	591
36-45 years; n=88715		46-55 years; n=70655	
DM2- DLIP	1,871	DM2- HTN- DLIP	3,360
DM2- HTN	1,434	DM2- HTN	2,412
DM2- HTN- DLIP	1,344	DM2- DLIP	2,342
HTN- DLIP	1,207	HTN- DLIP	1,764
OBS- ECZM	934	HTN- ECZM	805
56-65 years; n=46008		Above 65 years; n=22863	
DM2- HTN- DLIP	3,486	DM2- HTN- DLIP	1,343
DM2- HTN	1,747	DM2- HTN	636
DM2- DLIP	1,226	DM2- HTN- DLIP- OSARTH	518
HTN- DLIP-	1,202	DM2- HTN- DLIP- ECZM	378
DM2- HTN- DLIP- ECZM	843	DM2- HTN- IHD- DLIP	366