



# The Burden of Chronic Obstructive Pulmonary Disease in Cardiovascular Diseases: A Non-Western Perspective

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Our previous article summarized the prevalence, complications, and implications of managing chronic obstructive pulmonary disease (COPD) in cardiovascular disorders (CVD)<sup>1</sup>. A critical limitation of the review was the predominance of cardiovascular disease and comorbid COPD data from the United States and Europe. This was mainly due to greater cardiovascular disease registries in the United States and Europe vs. the rest of the world. It becomes necessary to highlight a “non-Western” perspective for the prevalence of COPD in CVD at the regional level for guiding clinical decisions that will optimize resources and improve patients’ quality of life.

We reviewed the literature for the studies, which captured the status of comorbid COPD in cardiac patients, and were conducted in Asia, the Middle East, Africa, and South America conducted between 1981 to May 2020. The prevalence of COPD in heart failure (HF) and COPD in ischemic heart disease (IHD) and atrial fibrillation (AF) across different regions have been summarized in Tables 1 and 2, respectively.

One of the critical limitations of the evidence presented above has been the use of history/physical examination to diagnose COPD in cardiovascular disease patients. The prevalence varies from 3% to 30% in HF; the differences in prevalence can be accounted by reliance on clinical examination/history/medical records, instead of lung function tests,

to make a diagnosis. We now know that use of history/physical examination/medication can lead to both over-diagnosis and under-diagnosis of COPD. However, in the regions under consideration, it is prudent to assume that under-diagnosis of COPD is much more common than over-diagnosis, leading to poor health outcomes and increased healthcare costs in the long run. Another factor to look at is the general prevalence of COPD in the country where studies were conducted. One would expect at-least equal or ideally higher prevalence of COPD in HF/AF/IHD versus general population (Table 1) because of the common risk factors involved in pathogenesis of both COPD and heart disease. In certain studies such as the one by Barretto et al.<sup>2</sup>, the drastic difference in study reported COPD prevalence and general COPD prevalence might be due to recruiting bias and/or improper evaluation of airflow limitation leading to under-diagnosis of COPD.

Based on the evidence, we found that the burden of undiagnosed COPD in CVD remains high in the non-western regions of the world. Not surprisingly, 23% of patients with CVD have been shown to have spirometry-confirmed COPD in India<sup>3</sup>. In the middle east, 91.5% of patients with IHD with COPD were not previously diagnosed with COPD<sup>4</sup>. The results highlight the importance of active screening for COPD in CVD patients in these regions because of the potential to reduce long-term healthcare costs and morbidity amidst the resource constraints and predominance of risk factors for COPD and CVD progression.

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## Authors’ Contributions

Conceptualization: Deshmukh K, Khanna A. Methodology: Deshmukh K, Khanna A. Data curation: Deshmukh K, Khanna A. Investigation: Deshmukh K, Khanna A. Writing - original draft preparation: Deshmukh K, Khanna A. Writing - review and editing: Deshmukh K, Khanna A. Approval of final manuscript: all authors.

**Table 1.** Prevalence of COPD in HF registries outside of Europe and the United States

Study	Prevalence of COPD in the study (%)	Prevalence of COPD in general population by spirometry (%)	Method of COPD diagnosis	Country	Region
CONAREC-1999 <sup>5</sup>	16.10	14.5 <sup>6</sup>	History and/or clinical examination	Argentina	South America
IC-SAC-2002 <sup>5</sup>	19			Argentina	
IC-SAC-2004 <sup>5</sup>	13.80			Argentina	
CONAREC-2004 <sup>5</sup>	13.80			Argentina	
Barretto et al. <sup>2</sup>	3.85	15.8 <sup>7</sup>		Brazil	
Niteroi Study <sup>8</sup>	23			Brazil	
INTER-CHF - South America <sup>9</sup>	10			Argentina, Chile, Colombia, and Ecuador	
Yoshihisa et al. <sup>10</sup>	28	8.6 <sup>11</sup>	Spirometry	Japan	Asia
Onishi et al. <sup>12</sup>	27		Spirometry	Japan	
JASPER HHF <sup>13</sup>	7.70		Medical records	Japan	
KorAHF <sup>14</sup>	11	13.4 <sup>15</sup>	Clinical and/or history	Korea	
China PEACE <sup>16</sup>	30.40	13.6 <sup>17</sup>		China	
INTER-CHF - China <sup>9</sup>	8			China	
HERO HF <sup>18</sup>	9.50			China	
Trivandrum Heart Failure registry <sup>19</sup>	15.40	4.2 <sup>20</sup>		India	
INTER_CHF India <sup>9</sup>	16			India	
INTER_CHF_Malaysia and Philipines <sup>9</sup>	4			Malaysia and Philippines	
INTER-CHF Middle east <sup>9</sup>	4			Egypt, Qatar, and Saudi Arabia	Middle East
Alhabeeb et al. <sup>21</sup>	19.70	4.2 <sup>22</sup>		Saudi Arabia	
INTERCHF Africa <sup>9</sup>	2			Mozambique, Nigeria, South Africa, Sudan, and Uganda	Africa

COPD: chronic obstructive pulmonary disease; HF: heart failure.

## Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

## References

- Deshmukh K, Khanna A. Implications of managing chronic obstructive pulmonary disease in cardiovascular diseases. *Tuberc Respir Dis* 2021;84:35-45.
- Barretto AC, Nobre MR, Wajngarten M, Canesin MF, Ballas D, Serro-Azul JB. Heart failure at a large tertiary hospital of Sao Paulo. *Arq Bras Cardiol* 1998;71:15-20.
- Muralimohan BV, Ekbote G, Tousheed SZ, Ramanjenaya R. Prevalence of COPD in vascular diseases. *Eur Respir J* 2015;46:PA1131.
- Khassawneh BY, Samrah SM, Jarrah MI, Ibdah RK, Ibnian AM, Almistarehi AW, et al. Prevalence of undiagnosed COPD in male patients with coronary artery disease: a cross-sectional study in Jordan. *Int J Chron Obstruct Pulmon Dis* 2018;13:2759-66.
- Perna ER, Barbagelata A, Grinfeld L, Garcia Ben M, Cimbaro Canella JP, Bayol PA, et al. Overview of acute decompensated heart failure in Argentina: lessons learned from 5 registries during the last decade. *Am Heart J* 2006;151:84-91.
- Echazarreta AL, Arias SJ, Del Olmo R, Giugno ER, Colodenco FD, Arce SC, et al. Prevalence of COPD in 6 urban clusters in Argentina: the EPOC.AR study. *Arch Bronconeumol* 2018;54:260-9.

**Table 2.** Prevalence of COPD in IHD/AF registries outside of Europe and the United States

	Prevalence of COPD in the study (%)	Method of COPD diagnosis	Country	Region
<b>IHD</b>				
Gagliardi et al. <sup>23</sup>	3.9	Medical records/clinical examination/history	Argentina	South America
Garcia Aurelio et al. <sup>24</sup>	6		Argentina	
Korea AMI Registry <sup>25</sup>	2.1		Korea	Asia
National Health Insurance database <sup>26</sup>	28.3		Taiwan	
Das et al. <sup>27</sup>	52	Spirometry	India	
Mahendra et al. <sup>28</sup>	11		India	
Jayamani and Chopra <sup>29</sup>	11.5		India	
Khassawneh et al. <sup>4</sup>	15.7		Jordan	Middle East and Africa
GULF RACE <sup>30</sup>	5.3	Medical records	Bahrain, Kuwait, Qatar, Oman, United Arab Emirates, and Yemen	
Ibnian et al. <sup>31</sup>	12.4	Spirometry	Jordan	
Yangui et al. <sup>32</sup>	20.5		Tunisia	
<b>AF</b>				
Albina et al. <sup>33</sup>	7.7	Medical records/clinical examination/history	Argentina	South America
Yang et al. <sup>34,35</sup>	11.7	Spirometry	China	Asia
JCARE-CARD <sup>36</sup>	6.2	Medical records/clinical examination/history	Japan	
IHRS-AF <sup>37</sup>	7.8		India	
GULF SAFE <sup>38</sup>	5.3		Bahrain, Kuwait, Qatar, Oman, United Arab Emirates, and Yemen	Middle East

COPD: chronic obstructive pulmonary disease; IHD: ischemic heart disease; AF: atrial fibrillation.

- Menezes AM, Jardim JR, Perez-Padilla R, Camelier A, Rosa F, Nascimento O, et al. Prevalence of chronic obstructive pulmonary disease and associated factors: the PLATINO Study in Sao Paulo, Brazil. *Cad Saude Publica* 2005;21:1565-73.
- Tavares LR, Victor H, Linhares JM, de Barros CM, Oliveira MV, Pacheco LC, et al. Epidemiology of decompensated heart failure in the city of Niteroi: EPICA - Niteroi Project. *Arq Bras Cardiol* 2004;82:125-8.
- Dokainish H, Teo K, Zhu J, Roy A, AlHabib KF, ElSayed A, et al. Global mortality variations in patients with heart failure: results from the International Congestive Heart Failure (INTER-CHF) prospective cohort study. *Lancet Glob Health* 2017;5:e665-72.
- Yoshihisa A, Takiguchi M, Shimizu T, Nakamura Y, Yamauchi H, Iwaya S, et al. Cardiovascular function and prognosis of patients with heart failure coexistent with chronic obstructive pulmonary disease. *J Cardiol* 2014;64:256-64.
- Minakata Y, Ichinose M. Epidemiology of COPD in Japan. *Nihon Rinsho* 2011;69:1721-6.
- Onishi K, Yoshimoto D, Hagan GW, Jones PW. Prevalence of airflow limitation in outpatients with cardiovascular diseases in Japan. *Int J Chron Obstruct Pulmon Dis* 2014;9:563-8.
- Sato Y, Yoshihisa A, Oikawa M, Nagai T, Yoshikawa T, Saito Y, et al. Prognostic impact of chronic obstructive pulmonary disease on adverse prognosis in hospitalized heart failure patients with preserved ejection fraction: a report from the JASPER registry. *J Cardiol* 2019;73:459-65.
- Lee SE, Cho HJ, Lee HY, Yang HM, Choi JO, Jeon ES, et al. A multicentre cohort study of acute heart failure syndromes in Korea: rationale, design, and interim observations of the Korean Acute Heart Failure (KorAHF) registry. *Eur J Heart Fail* 2014;16:700-8.
- Yoo KH, Kim YS, Sheen SS, Park JH, Hwang YI, Kim SH, et al. Prevalence of chronic obstructive pulmonary disease in Ko-

- rea: the fourth Korean National Health and Nutrition Examination Survey, 2008. *Respirology* 2011;16:659-65.
16. Yu Y, Gupta A, Wu C, Masoudi FA, Du X, Zhang J, et al. Characteristics, management, and outcomes of patients hospitalized for heart failure in China: the China PEACE Retrospective Heart Failure Study. *J Am Heart Assoc* 2019;8:e012884.
  17. Fang L, Gao P, Bao H, Tang X, Wang B, Feng Y, et al. Chronic obstructive pulmonary disease in China: a nationwide prevalence study. *Lancet Respir Med* 2018;6:421-30.
  18. Li L, Liu R, Jiang C, Du X, Huffman MD, Lam CSP, et al. Assessing the evidence-practice gap for heart failure in China: the Heart Failure Registry of Patient Outcomes (HERO) study design and baseline characteristics. *Eur J Heart Fail* 2020;22:646-60.
  19. Sanjay G, Jeemon P, Agarwal A, Viswanathan S, Sreedharan M, Vijayaraghavan G, et al. In-hospital and three-year outcomes of heart failure patients in South India: the Trivandrum Heart Failure Registry. *J Card Fail* 2018;24:842-8.
  20. India State-Level Disease Burden Initiative CRD Collaborators. The burden of chronic respiratory diseases and their heterogeneity across the states of India: the Global Burden of Disease Study 1990-2016. *Lancet Glob Health* 2018;6:e1363-74.
  21. Alhabeeb W, Elasar A, AlBackr H, AlShaer F, Almasood A, Alfaleh H, et al. Clinical characteristics, management and outcomes of patients with chronic heart failure: results from the heart function assessment registry trial in Saudi Arabia (HEARTS-chronic). *Int J Cardiol* 2017;235:94-9.
  22. Al Ghobain M, Alhamad EH, Alorainy HS, Al Kassimi F, Lababidi H, Al-Hajjaj MS. The prevalence of chronic obstructive pulmonary disease in Riyadh, Saudi Arabia: a BOLD study. *Int J Tuberc Lung Dis* 2015;19:1252-7.
  23. Gagliardi JA, Charask A, Perna E, D'Imperio H, Bono J, Castillo Costa Y, et al. National survey of ST-segment elevation acute myocardial infarction in Argentina (ARGEN-IAM-ST). *Rev Argent Cardiol* 2016;84:524-33.
  24. Garcia Aurelio M, Cohen Arazi H, Higa C, Gomez Santa Maria HR, Mauro VM, Fernandez H, et al. Acute myocardial infarction with persistent ST-segment elevation: SCAR (acute coronary syndromes in Argentina) multicenter registry from the Argentine Society of Cardiology. *Rev Argent Cardiol* 2014;82:275-84.
  25. Lee JH, Park HS, Chae SC, Cho Y, Yang DH, Jeong MH, et al. Predictors of six-month major adverse cardiac events in 30-day survivors after acute myocardial infarction (from the Korea Acute Myocardial Infarction Registry). *Am J Cardiol* 2009;104:182-9.
  26. Su TH, Chang SH, Chen PC, Chan YL. Temporal trends in treatment and outcomes of acute myocardial infarction in patients with chronic obstructive pulmonary disease: a nationwide population-based observational study. *J Am Heart Assoc* 2017;6:e004525.
  27. Das S, Mukherjee S, Kundu S, Mukherjee D, Ghoshal AG, Paul D. Presence and severity of COPD among patients attending cardiology OPD of a tertiary healthcare centre. *J Indian Med Assoc* 2010;108:406-9.
  28. Mahendra M, S SK, Desai N, Bs J, Pa M. Evaluation for airway obstruction in adult patients with stable ischemic heart disease. *Indian Heart J* 2018;70:266-71.
  29. Jayamani M, Chopra RK. Prevalence of undiagnosed chronic obstructive pulmonary disease (COPD) in stable ischemic heart disease patients attending a cardiac clinic. *Am J Respir Crit Care Med* 2020;201:A5108.
  30. Hadi HA, Zubaid M, Al Mahmeed W, El-Menyar AA, Ridha M, Alsheikh-Ali AA, et al. Prevalence and prognosis of chronic obstructive pulmonary disease among 8167 Middle Eastern patients with acute coronary syndrome. *Clin Cardiol* 2010;33:228-35.
  31. Ibnian AM, Al-Mistarehi AH, Zghayer AA, Abuqudairi SI, Samrah SM, Jarrah MI, et al. Undiagnosed chronic obstructive pulmonary disease in patients undergoing cardiac catheterization. *Am J Respir Crit Care Med* 2018;197:A5061.
  32. Yangui F, Touil A, Antit S, Zakhama L, Youssef SB, Charfi MR. Prevalence of lung function abnormalities in smokers with ischemic heart disease. *Eur Respir J* 2019;54:PA2667.
  33. Albina G, De Luca J, Conde D, Giniger A. Atrial fibrillation: an observational study with outpatients. *Pacing Clin Electrophysiol* 2014;37:1485-91.
  34. Yang YM, Shao XH, Zhu J, Zhang H, Liu Y, Gao X, et al. Risk factors and incidence of stroke and MACE in Chinese atrial fibrillation patients presenting to emergency departments: a national wide database analysis. *Int J Cardiol* 2014;173:242-7.
  35. Huang B, Yang Y, Zhu J, Liang Y, Zhang H, Tian L, et al. Clinical characteristics and prognostic significance of chronic obstructive pulmonary disease in patients with atrial fibrillation: results from a multicenter atrial fibrillation registry study. *J Am Med Dir Assoc* 2014;15:576-81.
  36. Hamaguchi S, Yokoshiki H, Kinugawa S, Tsuchihashi-Makaya M, Yokota T, Takeshita A, et al. Effects of atrial fibrillation on long-term outcomes in patients hospitalized for heart failure in Japan: a report from the Japanese Cardiac Registry of Heart Failure in Cardiology (JCARE-CARD). *Circ J* 2009;73:2084-90.
  37. Vora A, Kapoor A, Nair M, Lokhandwala Y, Narsimhan C, Ravikishore AG, et al. Clinical presentation, management, and outcomes in the Indian Heart Rhythm Society-Atrial Fibrillation (IHRS-AF) registry. *Indian Heart J* 2017;69:43-7.
  38. Domek M, Li YG, Gumprecht J, Asaad N, Rashed W, Alsheikh-Ali A, et al. One-year all-cause mortality risk among atrial fibrillation patients in Middle East with and without diabetes: the Gulf SAFE registry. *Int J Cardiol* 2020;302:47-52.