

Ethnicity: A Missing Variable When Defining Normative Values for Reporting Echocardiographic Studies

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Dear Editor,

The effectiveness of any diagnostic test is dependent upon the ability of the test to accurately detect abnormalities. An assumption of reliability and validity underlies all medical tests and echocardiography is no exception. The identification of 'abnormal' relies on the definition of 'normal' and needs to acknowledge normal physiological variation that may arise from factors such as age, body size, gender, and ethnicity (1). So far, the studies that have been designed to obtain the normative values for echocardiographic measurements have related the measured parameters to subjects' age, height, weight, body surface area and gender. Only a few have taken into account the role of ethnicity. As a result current guidelines for chamber quantification by echocardiography (2) contains reference values that have been obtained from European (Western Europe) and American (United States) Caucasian subjects. However, ethnicity is an important factor and studies which have compared measurements performed in Caucasians, Indians, Malaysian and Chinese (3, 4), Japanese (5, 6) or African American (7) subjects have shown significant differences in measurements between the different ethnical groups. Therefore, the use of the reference values reported in current guidelines to define normality or abnormality of cardiac chamber size and function in population others than European and White Americans may be misleading and bring to erroneous conclusions.

This is not only a medical problem of the areas of the world non-represented in current guidelines like Middle-East, Asia, Africa or South America but, since more and more people move from their area of origin to different areas of the world for working, tourism or to escape from war or persecution this lack of proper reference values is becoming a worldwide medical problem. Accordingly, several initiatives have been undertaken to collect nor-

mative data from larger cohorts of normal subjects who may include different ethnicities (8, 9). The EchoNoRMAL study is an individual person data meta-analysis of echocardiographic measurements obtained from healthy subjects aimed to re-define normal echocardiographic reference ranges (for the left heart including dimensions, areas, volumes, and associated calculated variables) for populations across the world, and to do that, the organizing Institution (the University of Auckland, New Zealand) asked data from those populations to the different researchers around the world (9). However, when they looked at the data of almost 70,000 healthy subjects collected from several institutions around the world they discovered that there were no data about people from South America, Africa and Middle-East (Poppe KK and Whalley G, personal communication).

With this background in mind, the study by Sadeghpour et al. (10) published in the Archives of Cardiovascular Imaging assumes particular scientific relevance. To the best of my knowledge, this is the first report about echocardiographic reference values for cardiac chambers obtained from normal Iranian subjects. Since the data where obtained in a large cohort of carefully screened healthy subjects they will definitely fill an existing gap in our knowledge. The study by Sadeghpour et al. (10) is also valuable because they used state of the art echocardiographic systems with second harmonic imaging, made a comprehensive echo study which included Doppler flow and tissue Doppler analysis and were able to provide the results stratified by gender and age decades. In summary they provided a comprehensive framework to be used to discriminate between normal and abnormal echocardiographic measurements in that population. Not surprisingly they found that cardiac chambers of Iranian subjects are smaller and limits of normality are lower than those reported in current guidelines (2). From the clinical point of view it means that if reference values

contained in the current guidelines (2) are applied to the Iranian population there is a sizable risk to miss initial remodeling of cardiac cavities that is often an early sign of cardiac dysfunction.

More studies like the one by Sadeghpour et al. (10) are needed to be able to identify early cardiac chamber enlargement accurately in patients from different ethnicities.

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References

1. Badano L, Solinas L, Cassin M, Zanuttini D. [Inescapable relativity of normal values in echocardiography]. *Cardiologia*. 1999;**44**(2):147-53.
2. Lang RM, Bierig M, Devereux RB, Flachskampf FA, Foster E, Pellikka PA, et al. Recommendations for chamber quantification. *Eur J Echocardiogr*. 2006;**7**(2):79-108.
3. Chahal NS, Lim TK, Jain P, Chambers JC, Kooner JS, Senior R. Population-based reference values for 3D echocardiographic LV volumes and ejection fraction. *JACC Cardiovasc Imaging*. 2012;**5**(12):1191-7.
4. Willis J, Augustine D, Shah R, Stevens C, Easaw J. Right ventricular normal measurements: time to index? *J Am Soc Echocardiogr*. 2012;**25**(12):1259-67.
5. Fukuda S, Watanabe H, Daimon M, Abe Y, Hirashiki A, Hirata K, et al. Normal values of real-time 3-dimensional echocardiographic parameters in a healthy Japanese population: the JAMP-3D Study. *Circ J*. 2012;**76**(5):1177-81.
6. Muraru D, Badano LP, Peluso D, Dal Bianco L, Casabianca S, Kocabay G, et al. Comprehensive analysis of left ventricular geometry and function by three-dimensional echocardiography in healthy adults. *J Am Soc Echocardiogr*. 2013;**26**(6):618-28.
7. Zabalgoitia Miguel, Rahman SNoor Ur, Haley William E, Oneschuk Lori, Yunis Carla, Lucas Charles, et al. Impact of Ethnicity on Left Ventricular Mass and Relative Wall Thickness in Essential Hypertension. *Am J Cardiol*. 1998;**81**(4):412-417.
8. Lancellotti P, Badano LP, Lang RM, Akhaladze N, Athanassopoulos GD, Barone D, et al. Normal Reference Ranges for Echocardiography: rationale, study design, and methodology (NORRE Study). *Eur Heart J Cardiovasc Imaging*. 2013;**14**(4):303-8.
9. Poppe KK, Doughty RN, Whalley GA. Redefining normal reference ranges for echocardiography: a major new individual person data meta-analysis. *Eur Heart J Cardiovasc Imaging*. 2013;**14**(4):347-8.
10. Sadeghpour Anita, Shahrabi Mohammadreza, Bakhshandeh Hooman, Naderi Nasim. Normal Echocardiographic Values of 368 Iranian Healthy Subjects. *Arch Cardiovasc Image*. 2013;**1**(2):72-79.