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EDITORIAL COMMENT

Routine Antenatal Echocardiography in Low- and Middle-Income Countries

Ready for a Rollout?

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The estimated prevalence of heart disease among pregnant women attending antenatal clinics ranges from 1% to 4%. Heart disease significantly increases the risk of adverse maternal and fetal outcomes. As most of the low- and middle-income countries (LMICs) undergo obstetric transition, heart disease is emerging as a major contributor to maternal deaths, mirroring trends in high-income countries.[1] First-time diagnosis of heart disease during pregnancy, along with late pregnancy assessment and delayed recognition, is linked to poor pregnancy outcomes.[2-4] Early detection is crucial as it offers opportunities for risk stratification, optimization of care, and preparation for a safe delivery. A standardized approach to cardiovascular disease screening during pregnancy is essential to reduce maternal morbidity and mortality. The California Cardiovascular Screening Tool [5] recommends meticulous clinical evaluation to identify red flags in patients who may benefit from further investigations, such as echocardiography. However, in LMICs where the prevalence of rheumatic heart disease is high, routine universal antenatal echocardiography (RANE) is particularly relevant for the early detection. Various echocardiographic screening methods (see **Figure 1**) have been explored in these settings. These include image acquisition by trained obstetricians,[6] health care workers,[7] and nurses [8] with remote image interpretation by cardiologists. Echocardiographic screening by trained medical students [9] with local image interpretation by cardiologists has also been tested in LMICs. Additionally, regular echocardiography performed by cardiologists has been part of standard care in some settings.[10,11] Most studies conducted universal screening of all antenatal women, whereas Alsharqi et al[6] focused screening on those with a clinical suspicion of heart failure.

We commend the paper by Bhatti et al,[12] featured in this issue of *JACC: Advances*, which presents findings from the PRESAP (Prospective Pakistan Registry of Echocardiographic Screening in Asymptomatic Pregnant Women) registry in Pakistan. The study involved standardized, limited transthoracic echocardiogram screenings conducted by trained sonographers on 15,068 pregnant women without active cardiorespiratory symptoms or known heart disease at a large obstetric clinic. Women who had more than mild structural heart disease (SHD) or congenital heart disease subsequently underwent a detailed transthoracic echocardiogram. The overall prevalence of SHD In the PRESAP registry was 3.8%. Left ventricular systolic dysfunction (LVSD) was observed in 2.2% of the patients, valvular heart disease in 1.2%, and congenital heart disease in 0.5%. Notably, nearly half of the patients with LVSD had a left ventricular ejection fraction below 40%. Additionally, two-thirds of the valvular heart disease cases were of rheumatic origin.

The proportion of LVSD (2.2%) in the PRESAP study is higher than previously reported prevalence data (see **Figure 1**). Studies from LMICs reported the prevalence of LVSD in the screened antenatal population in the range of 0.0% to 0.4% (Nascimento 0.4%, Otto 0.3%, Patel 0.25%, Beaton 0.05%, Bozkoya and Selvarani 0%).[7-11,13] The higher prevalence of LVSD in the

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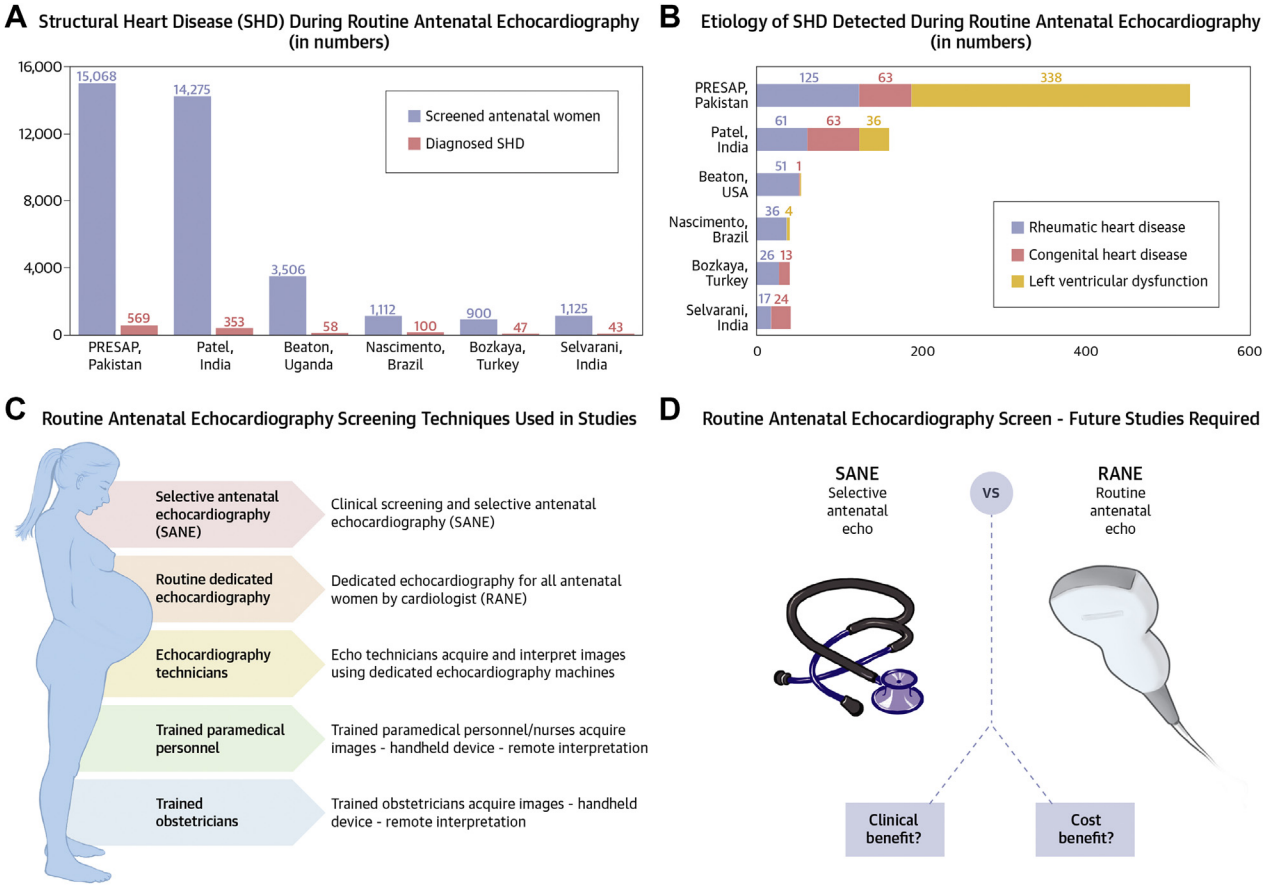
FIGURE 1 Routine Antenatal Echocardiography: Strategies Employed in Studies



RANE = routine antenatal echocardiography; SANE = selective antenatal echocardiography; SHD = structural heart disease.

PRESAP registry is accompanied by an intriguing observation: patients with significant LVSD with a left ventricular ejection fraction of <40% (n = 147) remained asymptomatic during pregnancy. Bhatti et al[12] report LVSD without providing additional information on the underlying etiology. Of the 338 patients with LVSD, congenital or rheumatic heart disease was detected only in 37 patients. The cause of LVSD was not reported in the remaining 301 participants. Furthermore, with three-fourths of LVSD cases identified in the third trimester, the possibility of peripartum cardiomyopathy was raised. However, the absence of symptoms and nonavailability of clinical findings make a definitive diagnosis of possibility of peripartum cardiomyopathy challenging. In LMICs, nutritional deficiencies, particularly thiamine deficiency, are common causes of LVSD.

The PRESAP registry managed to screen 70% of the eligible population, highlighting the logistical challenges of implementing a RANE strategy in a high-volume center. Notably, 70% of these screenings were conducted in the third trimester, reducing the opportunity for early risk stratification and targeted management to optimize cardiac status before delivery. Early RANE not only allows time for optimizing disease management but also provides options for safe pregnancy termination if continuing the pregnancy is deemed unsafe for the mother. Additionally, in regions endemic to rheumatic heart disease, early detection identifies those who would benefit from rheumatic fever prophylaxis. In the PRESAP registry, women identified with SHD were referred to cardio-obstetric care, but it remains unclear whether this affected the subsequent management and outcomes of the pregnancy. A recent systematic review of the RANE found that none of the included studies could provide direct evidence of its impact on maternal, fetal, and neonatal outcomes,

highlighting the need for further investigation to address this knowledge gap.[14]

Bhatti et al demonstrated the feasibility of RANE in a large-volume obstetric center. Although implementing the RANE has potential advantages, its limitations include the limited availability of echocardiographic facilities, a lack of skilled workforce for assessments, high out-of-pocket expenses for routine care, and the risk of overloading existing systems, which could compromise quality. There is no consensus on whether the RANE should be offered as a standard of care in antenatal clinics. Furthermore, we lack consensus on the ideal gestational age for initial screening, the need for repeat screening, or who should perform them.

Task sharing studies on echocardiography by paramedical personnel, harnessing the power of artificial intelligence in optimizing image acquisition, may facilitate the implementation of RANE in resource-constrained settings. Comparative studies on the clinical benefit of routine vs selective antenatal echocardiography and the cost-effectiveness of these approaches are warranted in LMIC settings to support informed and evidence-based policy decisions on resource allocation. However, it is important to note that RANE is not a substitute for comprehensive clinical assessment, even if it is a cost-effective strategy for early identification of SHD.

In our opinion, health care systems must identify the most appropriate antenatal screening strategy for cardiovascular disease based on the existing human resources, budget allocations, and health care infrastructure. The chosen screening strategy should aim to improve access to health care for pregnant women, especially those of lower socioeconomic status, and reduce the percentage of misdiagnoses and delays in the initiation of appropriate cardio-obstetric care.

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