CASE REPORT
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CARDIOVASCULAR RISK SCREENING OPTIONS IN DIABETES: FRAMEWORK FOR SELECTIVE ADOPTION

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ABSTRACT

Background: There exist several models for assessment of risk of cardiovascular disease (CVD), including different criteria for diagnosis of obesity, of which a major disparity is 'definition of waist circumference'. Case reports and comparative reviews are hereby presented to exemplify that one cap 'model' does not fit all.

Cases: First case illustrates how very slim person with BMI of 17 may possess cardiovascular risk ≥22.7% compared to an obese individual who has a BMI of 39 with CVD risk ≤8.0%. Second case review illustrates how the same BMI and lipid models vary in outcomes depending on gender. Third case report shows how different 'definitions of waist circumference' impacts on identification of obesity, which in turn affect decision about metabolic syndrome.

Conclusion: The needs for paradigm shift and 5-step framework are briefly highlighted.

Keywords: cardiovascular risk, low-mid income communities, screening models, the 5As framework

INTRODUCTION

Much may have been learnt of sudden death, but the skills to use available resources to screen individuals at risk for SCD within the population remains poor [1]. Some may have lost either a family member or friend to sudden death. Sudden death is a real clinical term that is otherwise known as cardiovascular accident (CVA) or heart failure. It is characterized by metabolic syndrome and/or 'subclinical cardiovascular disease (SCVD) factors' that cause the heart to fail suddenly. A person who harbours the 'SCVD factors' could be apparently healthy and unaware of her/his risk of heart disease.

What is probably elusive about sudden death (hence a health counselling issue) is that about 80% of cardiovascular disease (CVD) deaths worldwide take place in developing, low-mid income communities (LMIC), and also account for 86% of the global CVD burden [2-4]. It is pertinent to note that this problem has underpinned the research grant funding by the Global Alliance for Chronic Disease for the 2015 [5]. While little or no social healthcare is institutionalized for CVD counselling; and primary healthcare providers are marginally effective [6], some allied health professionals are offering suboptimal counselling service [7]. A quick review of health services available to CVD patients in LMIC may reveal the need for allied health professionals to awake to their counselling roles in the screening and early identification of CVD risk. In other words "education and awareness among the population remain important steps in reducing the impact of this condition."[1]

Different CVD risk factor stratification models exist [8-10]. It is known that some models overestimate risks relative to others. For instance, comparisons have been done on Framingham and Reynolds Risk scores for global cardiovascular risk prediction, whereby the former was reported to have overestimated risk for coronary heart disease and major CVD [9]. Otherwise, comparison of various models is quite controversial or difficult, especially as every model either underestimates or overestimates risk [11]. Further, body mass index (BMI) and waist circumference are different measures of obesity reported to suit different populations. What is yet to be emphasized in educational models and programs is the need for 'selective adoption' as well as the adoptability for patient education and counselling in LMIC

Case 1: Different models of cardiovascular risk give different screening outcome

Case: apparently healthy 40 years old, 175cm tall female who weighed 70Kg and was a non-smoker. Review: One of the models of screening is the flowchart based on the Framingham Heart Study [12], which depends on blood lipid profile. For this case, 10year CVA risk of the patient is 5.9% and estimated heart and vascular age is 58 years based on 'lipid' model (Fig. 1). This outcome is different from BMI model. The other is the New Zealand Guidelines Group (NZGG) model [13]. For the same patient, NZGG model's estimate is indeterminate, because the chart is limited in total cholesterol range. A third model is the interactive algorithm from the British United Provident Association (BUPA) [14], which estimated CVA risk on a scale and the health age of case to be 37 years – i.e. younger or relatively healthier (Fig. 2).

Case 2: Comparative review of BMI and lipid models

To demonstrate that risk scores from BMI model is different relative to when lipid profile is used, a hypothetical situation is presented. All twelve individuals are apparently healthy, 'non-diabetic', non-smokers, same age (50 years old) and have the same blood pressure of 140/80 mmHg (Table 1).

The cases on Table 1 indicate that Cases 1 – 4 are clinically obese (BMI > 30) with relatively normal cholesterol levels (TC/HDL <3.3). Cases 5 – 7 have borderline BMI and cholesterol levels. On the other hand, cases 8 – 10 are non-obese with classical dyslipidaemia while 11th and 12th Cases are both anorexic (perhaps malnourished in the poverty context) and dyslipidaemic.

Results of CVD risk using the Framingham models based show that the BMI model yields a higher risk value in obese individuals compared to the lipid model, but probably only in males. On the corollary, the lipid model yields higher risk level in non-obese individuals, especially in females. In particular, the 12th Case compared to Cases #2, 4, 6, & 8 indicate that a very slim person can have metabolic syndrome or higher CVD risk relative to an obese.

Case 3: Discrepancies in criteria for diagnosis of obesity and metabolic syndrome

It is known that there are different criteria for the diagnosis of cardiometabolic syndrome including but not limited to the World Health Organization (WHO) 1999, International Diabetic Federation (IDF) 2005 and National Cholesterol Education Program Adult Treatment Panel III (ATP III) 2001. One of the fundamental differences between the various criteria is definition of obesity. There apparently exist different criteria for diagnosis of obesity (either BMI or waist circumference), of which there is disparity in definition of waist circumference.

Measurements from a case of 48yo man are presented for the purpose of evaluation of three different definitions of waist circumference as a diagnostic factor of obesity and metabolic syndrome (Table 2). The table expatiates that while there is discrepancy in the diagnosis of obesity when waist circumference instead of BMI is used, different 'definitions of waist circumference' also impacts on identification of obesity.

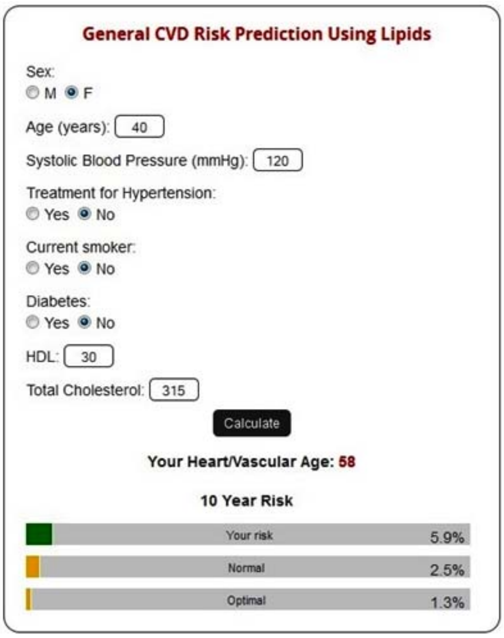

Fig 1: CVD risk screening outcome for Case 1 based on Framingham lipid model

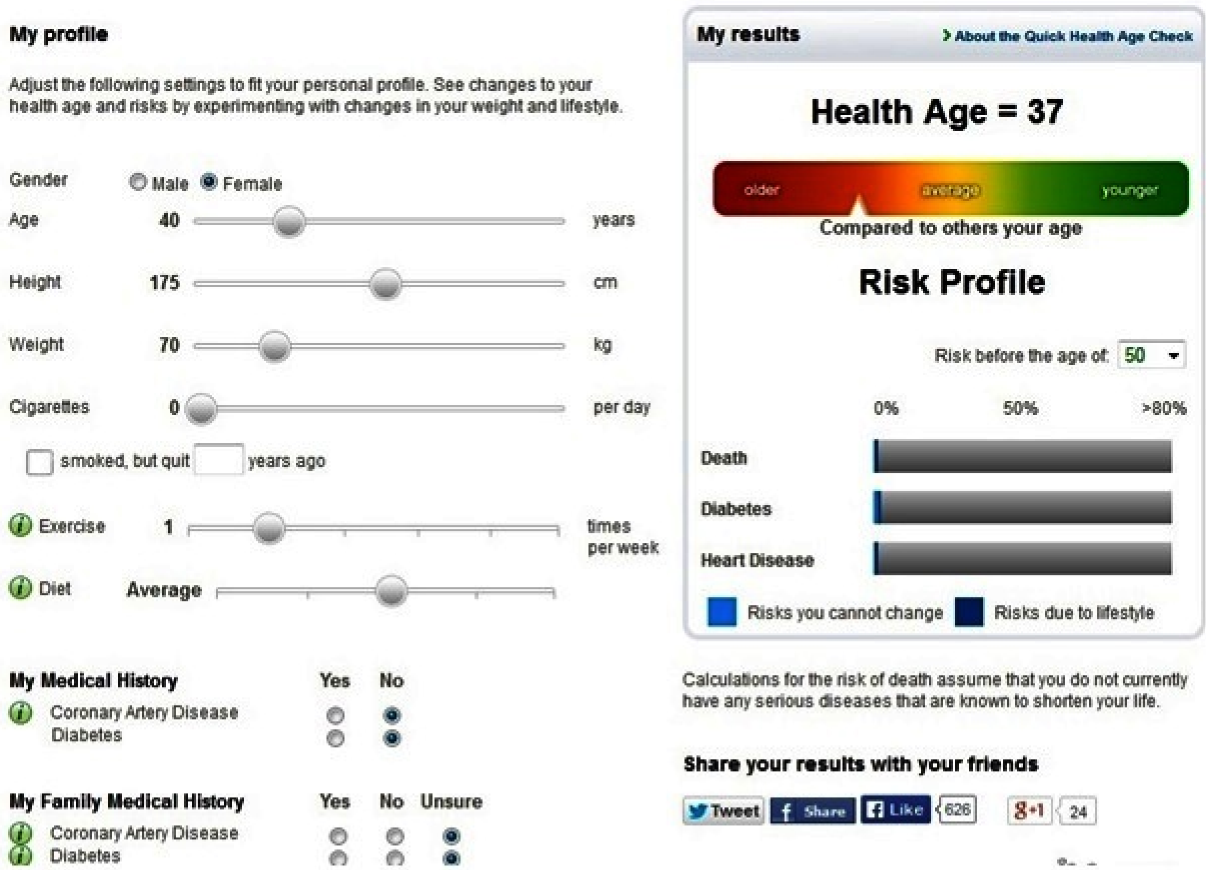

Fig 2: CVD risk screening outcome for Case 1 based on BUPA model

Table 1: Comparative outcomes of CVD risk in Framingham's BMI vs. lipid models

Case #	Gender	BMI model			lipid model		
		Weight (Kg)	Height (m)	CVD risk	TC (mg/dL)	HDL (mg/dL)	CVD risk
1	M	135	1.85	15.40%	190	65	7.20%
2*‡	F	120	1.75	7.60%	195	60	8.00%
3	M	110	1.8	14.00%	188	60	7.70%
4*	F	100	1.7	7.20%	192	64	7.40%
5	M	90	1.8	12.10%	220	40	7.90%
6	F	85	1.7	7.00%	200	40	11.70%
7	M	80	1.75	11.50%	180	40	6.20%
8	F	70	1.75	5.90%	280	40	9.60%
9	M	65	1.75	9.80%	260	40	15.40%
10	F	60	1.75	5.50%	360	30	27.10%
11	M	55	1.8	8.30%	340	30	15.70%
12†	F	50	1.75	4.90%	300	30	22.70%

HDL: high density cholesterol; TC: total cholesterol
*Both models give approximately the risk – compared to others with discrepant outcomes
‡Normo-lipidaemic obese (BMI = 39) for comparison with case #12
†Dyslipidaemic underweight (BMI = 17) for comparison with case #2, 4, 6 & 8

Table 2: Waist circumference as diagnostic factor of obesity and metabolic syndrome (48yo man)

Other metabolic syndrome criteria		*Dyslipidaemia*, normoglycaemia, normotriglyceridaemia			
Body mass index (BMI)		95Kg/1.83m tall = 28.4 (non obese: BMI cut-off at 30)			
Blood pressure criteria		140/90 mmHg	*Abnormal*		
Obesity criteria		Value	AHA//NHLBI (>102 cm)	IDF‡ (>94 cm)	IDF† (90 cm)
WC	Caesar's preferred	100 cm	Normal*	*Obese*	*Obese*
	Navel point	105 cm	*Obese*	*Obese*	*Obese*
	ISO waist	92 cm	Normal*	Normal*δ	*Obese*

‡Recommendation for Middle East Mediterranean and Sub-Saharan Africa
†Recommendation for Ethnic Central and South America
*Decision on metabolic syndrome based on presence of x3 factors: negative where Caesar's preferred and ISO waist is normal
δThe average WC of men in our sub-Saharan Africa study population is < 90cm

DISCUSSION

Need for a paradigm shift in cardiovascular risk screening: In a research report from rural Virginia, it was investigated whether 'community health workers' (CHW) compared the 'Registered Nurses' (RN) can use a CVD risk screening tool. The CHW and RN were made to screen and segregate twenty-four participants for CVD risk into low risk (<10%), moderate risk (10 – 20%) and high risk. It was reported that about 38% attended healthcare for known disease risk. More importantly, it was identified that both the results CHW and RN groups were similar [10]. That is, similar to the RNs results and recommendations, the CHWs identified the same number of participants as low risk and also recommended the same number of participants for follow-up. In a previous report from our research screening, up to 52% could benefit from Framingham's BMI model, whereas less than 18% may require the lipid model [15].

The reports indicate that there is a gap between the knowledge, attitude and practice (KAP) toward CVD prevention vis-à-vis screening among low-mid income and/or rural community dwellers, which calls for improved measures of patients' education and counselling [10,15-17]. There is potential for allied health professionals to competently participate in CVD risk screening. This arguably calls for a paradigm shift to involve allied health professionals including CHW, counsellors and dietitians amongst others, from outside the conventional primary healthcare system to be engaged in CVD risk screening [10]. This is with a view for early identification and intervention of CVD, especially among the LMIC where most of the people hardly seek medical attention [1].

5As framework: There is a potential 5-step (also known as 5As – ask, assess, advise, assist and arrange) framework for preventive cardiovascular health [18], which could constitutes a model of healthcare, especially in the LMIC where patients seek little or no institutional counselling in health service system. The 5-step framework may appear to be an Australian model. Yet, it is a tool that is never limited to any race. What is now required is for allied health professionals including primary and community healthcare workers in LMIC to embrace the development and do some observational studies, especially with a view to improve cardiovascular health counselling. Perhaps, what is imperative is knowledge to use the CVD screening tools in community healthcare settings.

CONCLUSION

Regardless of gender, BMI models of CVD risk assessment would be more suitable for normolipidaemic obese individuals, but lipid model is necessary for non-obese patients. A framework can be used in LMIC whereby available models can be selectively adopted to enhance CVD screening in the process of individual patient education and counselling. This paper is never about overall superiority of one model over another, but to clarify that while comparative studies have been done, the discourse has yet to suggest a proposal for 'selective adoption', or adoptability in LMIC. Thus it is about how to improve early identification and intervention of CVD risk among LMIC population where allied healthcare professionals could play a central role. Given the identified gap in 'knowledge, attitude and practice' of LMIC people, which calls for a paradigm shift in public health education and counselling, the case reviews exemplify rationale for selective adoption of available models.

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