Original article:

The Ratio of Second to Fourth Digit Length (2D:4D) and Heart Disease

Kumar N[1], Sallehuddin MAB[2], Syed SMFB[2], Idris MHB[2], Jamba TA[2], Ravindra S[1] , patil J[1], Aithal A[1]

Abstract

Objectives: The risk of getting heart diseases is unpredictable due to many predisposing factors range from lifestyle to genetic inheritance. Scientist made the discovery after studying men of various age who had suffered heart disease made a finding; the length of ring fingers (4D) are shorter than index fingers (2D) are at greater risk of premature heart attack at their early 30. Based on these facts, we carried out this project work by analyzing 2D and 4D ratios with the perspective of risk of heart disease among the Malaysian undergraduate students. ***Materials and method:*** A cross sectional study using questionnaire about subject's family history of heart related problems if any, followed by measurement of length of second and fourth digit was carried out. 2D:4D ratio index was calculated. Data obtained were tabulated according to index more than 1 and less than 1. ***Results and discussion:*** In the present study, total 66 subjects (n= 120) presented with a ratio greater than 1.0, this accounted for a total of 55%, while remaining 45% of subjects had 2D:4D <1.0. Even though we couldn't confirmed that this test confirms an accurate indicator to determine the risk, it is yet the strongest predictor of heart disease later in life. ***Conclusion:*** We hope that this study could create awareness among the students with 2D4D ratio greater than 1.0 to avoid heart diseases by leading a better lifestyle with balanced diet and regular exercise.

Keywords: Heart disease; Second to fourth digit length ratio

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Introduction:

Heart disease (HD) is rapidly increasing in prevalence across the world. A simple and reliable indicator for the identification of the persons at risk of HD in the early stages of life is necessary in order to enable appropriate medical interventions. Many scientist and medical professional had conducted various studies on the causes of heart disease.

Young people who are at risk of heart disease early in their adult life can be identified simply by measuring their fingers length and their ratio [1]. The ring finger is the fourth digit of the human hand and the second most ulnar finger, while the index finger is the second digit of a human hand. It is the most

1. Naveen Kumar, Department of Anatomy, Melaka Manipal Medical College, Manipal campus, Manipal University, Manipal
2. Mohammad Arsyd Bin Sallehuddin
3. Syed Mohd Farris Bin Syed
4. Muhammad Hafiz Bin Idris
5. Terry Anak Jamba MBBS Students
   Melaka Mainpal Medical College, Manipal campus, Manipal University, Manipal
6. Swamy Ravindra S
7. Jyothsna patil
8. Ashwini Aithal
   Department of Anatomy, Melaka Manipal Medical College, Manipal campus, Manipal University, Manipal

Corresponds to: Dr Swamy Ravindra S, Department of Anatomy, Melaka Manipal Medical College, Manipal University, Manipal campus, Manipal 576 104 Karnataka, India
e-mail:ravindrammmc@gmail.com

dexterous and sensitive finger of the hand. Ratio between the length of 2nd digit and 4th digit (popularly known as 2D:4D ratio) is known to show correlations with certain disorders like Coronary artery disease (CAD) [1] and with behavioral traits [2]. Research report has emphasized the positive association between 2D:4D ratio in both hands of Chinese men and CAD [1]. This report also highlighted non-significant differences in mean 2D:4D ratio in the women with CAD and control of the same population [1].

A low 2D:4D ratio has been shown to correlate with high testosterone level which is characteristic of males, while a high 2D:4D ratio is correlated with low testosterone level, a characteristic of females [2]. In humans, finger length ratio of the index and ring finger (2D:4D) is a sexually dimorphic trait. The ratio between the length of the index and ring fingers (2D:4D) may correlate with in utero testosterone levels because, is sexually dimorphic. The males have been shown to have an average longer 4th digit length relative to their 2nd digits showing a low 2D:4D ratio than females who on average have a higher 2D:4D ratio [2].

Through this study, we aimed to examine if any correlation of 2D:4D ratio exists in the children of parents who have a history of heart related disorders. Thus, the ratio between length of second and fourth digit forms a hypothetical indicator to correlate the tendency of occurrence of heart disease. However, this may not confirm heart related disease in the individuals based on 2D-4D ratio values. The ratio of second to forth digit length (2D:4D) can be correlated with the tendency of having heart related complications in disease. If the ratio is greater than 1.0 with the family history of cardiac disorders, this might be considered as predictor of higher risk of suffering from heart related complications.

Materials and Method:

A cross sectional study using questionnaire about subject's health related aspects and their family history of heart related problems if any, and measurement of length of second and fourth digit at their palmar surface were performed in 120 students of Malaysian origin. Among this, there were 77 males and 23 females. 56 subjects of the study group had family history of having heart related diseases, while remaining 64 subjects had no such complications.

Data Collection Method:

The index finger and ring finger lengths were measured on the palmar surface of hands from the basal crease proximal to the palm to the tip of the finger. Length of these fingers was measured in both hands (right and left). The ratio index between 2nd and 4th digit (2D:4D) in terms of their length was obtained by dividing the length of 2nd digit by length of 4th digit. The ratio values were calculated for right and left side separately. The data values were grouped into two categories. Participants with their family h/o heart related diseases, participants without any family h/o of heart disease.

Ethical approval; The study was ethically approved by local ethics Committee.

Results:

The various ratio indices of 2D:4D on both hands between males and females; and between the participants with family h/o heart diseases and without h/o of heart diseases is shown in table 1.

Table 1: Ratio indices pattern of 2D:4D between right and left side

	Without family h/o heart disease		With h/o heart disease	
	Left	**Right**	**Left**	**Right**
Male	1.02	0.95	0.99	1.01
Female	0.96	0.96	0.98	0.99

In the present study, total 66 subjects (n= 120) presented with a ratio greater than 1.0, this accounted for a total of 55%, while remaining 45% of subjects had 2D:4D <1.0 as shown in the figure 1.

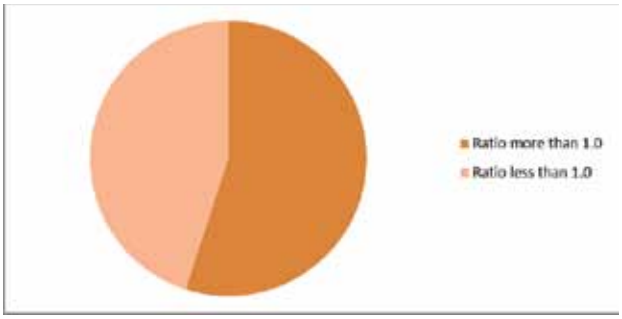

Figure 1. The 2D:4D profile of the participants.

Gender wise incidence showed higher prevalence of 2D:4D >1.0 in the male individuals (51.9%) than the female (32.5%) as shown in the figure 2.

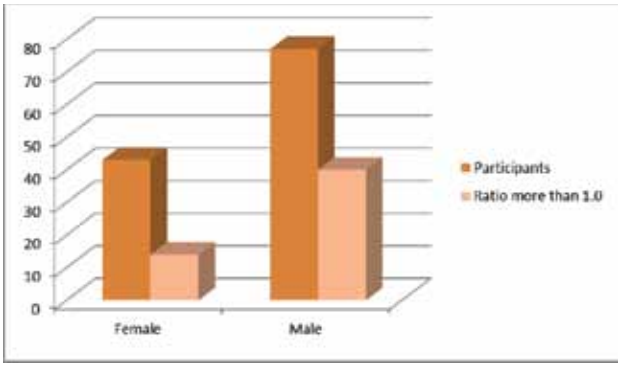

Figure 2. Gender wise prevalence of 2D:4D >1.

Among 120 subjects participated in the present study, 56 students had family history of heart related complications. The 2D-4D ratio in these 56 subjects was calculated and we noticed that 34 subjects of them had the ratio greater than 1.0 who accounted for 60.71% of prevalence. In remaining 64 individuals who had no family history of cardiac complications, the ratio more than 1.0 was observed in 20 subjects who accounted for 31.25% of prevalence as shown in figure 3.

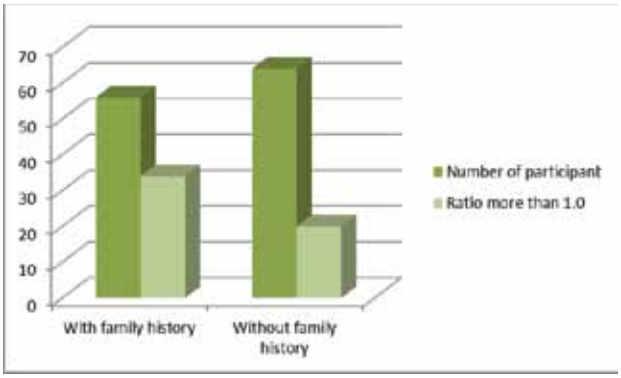

Figure 3. Pattern of 2D:4D indices of participants with or without family h/o with heart related disorders

Discussion:

The association between ratio of length of index finger (2D) and ring finger(4D), popularly known as 2D:4D and heart related disorders including coronary artery disease have been reported earlier. The present study was undertaken among the Malaysian students population with and without the family history of heart related complications.

In our study, about 20% of male individuals presented with 2D:4D > 1.0. It is remarkably lower than the female subjects of our study, where the ratio more than 1.0 was observed in more than 50% cases. The possible cause for this as reported by the previous researchers could be related to hormone levels. Further, it has been also reported about the development of the finger is strongly related to the level of estrogen in female. Thus, the reason of different length of finger is concluded to be related to the level of sex hormones in the body even before birth [2].

The mechanisms of the link between 2D:4D and coronary artery disease are not clear [1]. The reason for these differential observations among the gender is believed to be caused by the prenatal sex hormones which may also affect multiple organ system including cardiovascular system [3]. In a study conducted by Robinson et al., reported the inference as negative relation of 2D:4D with prenatal testosterone and positive relation with prenatal estrogen level [2]. However, for those with lower ratio, it doesn't necessarily mean that they would definitely have heart diseases at younger age compared to those of lower ratio [4-5].

To this context, we strongly believe that, correlation of 2D:4D with heart related disorder may not be a reliable parameter for the prediction of heart problem that could encounter later in older age. Further, regional differences based on geographic distribution could also play a role in the differential data as, in the current study we observe pertaining to Malaysian population. The limitation of our study includes the fact that, while conducting this study other aspect or parameters was not being taken into account. For example; stress level, level of cholesterol in the body, BMI of the person and also their lifestyle such as diet and frequents of exercise.

Conclusion:

In conclusion, based on the guide line given by our reference journal, nearly half of our subjects as conducted in Melaka Manipal Medical College, Manipal are having a high risk of getting heart problem early in life. Even though we couldn't confirmed that this test was definitely an accurate measurement for the determining the risk, it is yet the strongest predictor of heart disease later in life. We hope that by this study, we could create awareness among the student about leading a better lifestyle by balance diet and having exercise regularly.

Conflict of interest: None declared

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