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EXPLORING THE RELATIONSHIP BETWEEN BODY TEMPERAMENTS AND ANTHROPOMETRIC INDICES AS PREDICTORS OF DISEASE RISK AMONG UNDERGRADUATE STUDENTS

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Abstract
This study explores the relationship between Traditional body temperaments and anthropometric indices, including Body Mass Index (BMI), Waist/Hip Ratio (WHR), and Relative Fat Mass (RFM), to predict disease risks among undergraduate medical students. Traditional medicine classifies individuals into four temperaments (Sanguine, Choleric, Melancholic, Phlegmatic), each linked to distinct health profiles. Anthropometric data from 116 students were analyzed using ANOVA and post-hoc tests to determine significant differences in BMI, WHR, and RFM across temperaments. The results indicated that Phlegmatic individuals have the highest BMI and WHR, correlating with higher risks for cardiovascular diseases and diabetes. The findings underscore the value of integrating traditional temperament assessments with modern health metrics to guide personalized healthcare strategies.

INTRODUCTION

The philosophy of Temperament is a part of Greco-Arab or Islamic medicine, which is a holistic system deeply rooted in ancient Greek traditions and developed further by Arab and Persian scholars. It is based on the concept of the four humors: blood (Dam), yellow bile (Safra), black bile (Sauda) and phlegm (Balgham). These humors are responsible for the physiological and psychological balance in the human body, and their equilibrium defines an individual's temperament (Mizaj). The four temperaments recognized in traditional medicine are Sanguine (hot and moist), Choleric (hot and dry), Melancholic (cold and dry), and Phlegmatic (cold and moist). Each temperament is believed to influence an individual's physical characteristics, emotional responses, disease predisposition, and overall well-being (Jan et al., 2020).

The concept of temperament in medicine is central to understanding human health and disease. The theory of temperament has its origins in ancient Greece, particularly in the works of Hippocrates and Galen. Hippocrates, known as the "Father of Medicine," proposed that human health was governed by four bodily fluids or humors: blood, phlegm, yellow bile, and black bile. The balance or imbalance of these humors determined a person's temperament and overall health. Building upon Hippocratic ideas, Galen further developed the theory, linking the four humors to four temperaments: Sanguine, Phlegmatic, Choleric, and Melancholic. Each of these

temperaments was associated with specific personality traits and physical characteristics, such as energy levels, emotional disposition, and susceptibility to certain diseases.

Throughout history, this concept of temperament was integrated into various medical systems, which adopted the four humors and temperaments as central to understanding human health. In Eastern medicine, developed in the medieval Islamic world by scholars such as Avicenna, the concept of temperament was expanded to include a holistic approach to both physical and psychological well-being. Temperament assessment became a tool for diagnosing and treating diseases based on an individual's unique physical and mental constitution. This theory of temperament continued to influence medical thought in both Eastern and Western traditions well into the modern era, even as new scientific discoveries challenged and reshaped medical paradigms. Today, the historical framework of temperament remains a valuable lens through which practitioners of traditional medicine, including Eastern, assess the health risks and predispositions of individuals. This study explores the relationship between these ancient temperamental classifications and modern anthropometric indices to validate their relevance in contemporary healthcare.

According to principles follow by this system, every individual has a unique temperament determined by the dominance of a particular humor. This temperament not only shapes the personality and physical appearance of an individual but also predisposes them to specific diseases. For instance, individuals with a Sanguine temperament, characterized by hot and moist qualities, are generally more energetic and socially active, but they may also be prone to inflammatory conditions, infectious diseases and conditions associated with dominance of blood such as epistaxis. In contrast, those with Melancholic temperament, associated with cold and dry qualities, tend to be more introspective and prone to conditions such as constipation, depression and melancholia (Naz & Sherani, 2014).

Traditionally, this system emphasizes the "Flesh and Fat ratio" and the overall physique "Haiyat-ul-Aaza" as key indices for diagnosing a person's temperament. However, these gives only qualitative analysis which depends upon the skills and experiences of the examiner in contrast to modern anthropometric indices like Body Mass Index (BMI), Waist/Hip Ratio (WHR), and Relative Fat Mass (RFM) which gives quantitate analysis irrespective of the examiner's errors to assess health risks, particularly those associated with obesity and fat distribution. BMI is a simple and commonly used measure that classifies individuals based on body weight relative to 0height. However, it has limitations as it does not distinguish between muscle and fat mass, nor does it provide information about fat distribution, which is a critical factor in predicting health risks like cardiovascular disease (CVD) and type 2 diabetes (Piché et al., 2020). WHR, on the other hand, is a more reliable indicator of central obesity, which is strongly linked to metabolic disorders and CVD. It is particularly useful in predicting health risks independent of BMI, as abdominal fat is a key risk factor for atherosclerosis and insulin resistance (Seidell et al., 2001) (Rimm et al., 1995). RFM, a newer measure that incorporates waist circumference and height, offers a more accurate estimation of body fat percentage and is strongly associated with conditions like non-alcoholic fatty liver disease (NAFLD) and cardiovascular disease (Shen et al., 2023).

BMI, Waist-Hip Ratio (WHR), and Relative Fat Mass (RFM) can be correlated with Eastern temperaments, particularly when assessing an individual's propensity for specific ailments. According to Eastern theory, the balance of humors includes blood, phlegm, yellow bile, and black bile affects the body's overall health. For instance, theoretically individuals with a phlegmatic temperament (Balghami Mizaj) may have higher BMI and WHR due to their cold and moist nature, predisposing them to obesity-related conditions like metabolic syndrome and cardiovascular diseases. Conversely, a Melancholic temperament (Saudawi Mizaj), characterized by dryness and coldness, might be associated with lower body fat measures but increased risks of certain chronic conditions such as constipation and depression. Calculating BMI, WHR, and RFM within the context of Eastern medicine provides a modern quantifiable approach to traditional assessments, helping bridge ancient wisdom with contemporary science in evaluating health risks.

The integration of this medicine system with modern health assessments provides a unique perspective on

disease prevention and management. As practitioners use temperament as a diagnostic tool, considering it vital for understanding the etiology of diseases and their treatment. For example, Phlegmatic individuals, due to their cold and moist temperament, may be more prone to conditions like obesity, metabolic syndrome, and diabetes. This predisposition is reflected in their higher BMI and WHR, as seen in various studies linking temperamental qualities with modern health indices (Elagizi et al., 2018). These metrics offer unique benefits for assessing health risks. BMI remains useful for large-scale population studies due to its simplicity but fails to account for fat distribution. WHR and RFM, by contrast, are superior in evaluating risks related to central obesity and visceral fat, which are more directly linked to conditions like cardiovascular diseases, type 2 diabetes, and even certain cancers. Consequently, incorporating WHR and RFM alongside BMI in clinical assessments provides a more comprehensive understanding of an individual's disease risk profile.

This study aims to explore the relationship between temperaments and anthropometric indices to assess their potential as predictors of disease risks, including cardiovascular diseases, diabetes, and obesity. By correlating BMI, WHR, and RFM with the four temperaments, the study seeks to validate the use of traditional principles in modern medical practice, providing a more holistic approach to health risk assessment and management.

Methodology

Study Design and Participants

This cross-sectional study was conducted at the Faculty of Eastern Medicine under the Department of Human Nutrition and Dietetics. The study involved 116 female students whose temperaments were evaluated using a temperament chart based on the Canon of Medicine volume 1. Anthropometric measurements were collected, including BMI, Waist/Hip Ratio, and RFM using modern tool.

Temperament Classification

Temperaments were classified into four categories based on Eastern principles: Sanguine (hot and moist), Choleric (hot and dry), Melancholic (cold and dry), and Phlegmatic (cold and moist). The classification was guided by the interaction of the four primary qualities hot, cold, dry, and moist and the predominant humor. Temperament was assessed based on the morphological and psychological Parameters defined by Avicenna.

Data Collection and Analysis

Height in m^2 and weight in kg was measured by using normal lab measuring instrument with thin usual wearing cloths without shoes. BMI was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (m)}^2}$$

Waist/Hip Ratio was calculated as the ratio of waist circumference to hip circumference by using inch measuring tap.

RFM in percentage for all female students was determined using validated formulas that incorporate waist circumference, height, and sex by using following formula for female:

$$\text{RFM} = 76 - 20 \times \left(\frac{\text{height}}{\text{waist circumferance}}\right)$$

Statistical Analysis:

Data analysis involved comparing these indices across the four temperaments to identify significant differences. Statistical tests, including ANOVA and Tukey's post-hoc analyses, were employed to evaluate the relationships between temperament and anthropometric measures of BMI, Waist hip ratio and RFM.

Results

1. General Characteristics of Participants

The study sample consisted of 116 students classified into four Eastern temperaments: Phlegmatic (22.4 %), Sanguine (9.5 %), Choleric (47.4 %), and Melancholic (20.7%). Table 1 summarizes the demographic and anthropometric characteristics of the participants, including their BMI, Waist/Hip Ratio (WHR), and Relative Fat Mass (RFM). The Phlegmatic group had the highest mean BMI (23.35 ± 3.57), followed by the Sanguine (21.55 ± 4.71), Choleric (21.13 ± 3.36), and Melancholic (17.78 ± 1.70) groups. The WHR was also highest among the Phlegmatic and Sanguine groups (0.85), while the Melancholic group exhibited the lowest WHR (0.82). The RFM showed similar trends, with Phlegmatic individuals having the highest mean RFM (73.1%),

followed by the Choleric (72.82%), Sanguine (72.51%), and Melancholic (72.47%) groups.

Temperament	Number of Participants	BMI Mean ±SD	Waist/Hip Ratio Mean ± SD	Avg. RFM (%) Mean ± SD
Sanguine	11	21.55 ± 4.71	0.85 ± 0.02	72.51 ± 0.33
Choleric	55	21.13 ± 3.36	0.84 ± 0.04	72.51 ± 0.33
Melancholic	24	17.78 ± 1.70	0.82 ± 0.02	72.47 ± 0.48
Phlegmatic	26	23.35 ± 3.57	0.85 ± 0.03	72.82 ± 0.49

Table 1: Descriptive statistics and Anthropometric Characteristics of Participants

Tukey's multiple comparisons test	BMI		Waist hip ratio		RFM	
	Significant	Adjusted P Value	Significant	Adjusted P Value	Significant	Adjusted P Value
Phlegmatic vs. Sanguine	No	0.4806	No	0.9982	Yes	0.0382
Sanguine vs. Choleric	No	0.9837	No	0.3930	No	0.9570
Choleric vs. Melancholic	Yes	0.0015	No	0.1339	No	0.9774
Melancholic vs. Phlegmatic	Yes	<0.0001	Yes	0.0030	Yes	0.0027
Phlegmatic vs. Choleric	Yes	0.0381	No	0.1817	Yes	0.0017
Melancholic vs. Sanguine	Yes	0.0239	Yes	0.0283	No	0.9952

Table 2: One way ANOVA results between different groups of temperaments of participants. BMI, Basal metabolic index; RFM, relative fat mass; Yes means significant; No means non-significant. If p value is < 0.05 consider significant**.**

2. Comparison of Anthropometric Indices Across Temperaments

2.1. Body Mass Index (BMI)

ANOVA results revealed significant differences in BMI across the four temperaments ($p < 0.05$). Phlegmatic individuals exhibited a significantly higher mean BMI compared to the Melancholic ($p < 0.0001$) and Choleric ($p = 0.0381$) groups. The Phlegmatic group's high BMI suggests a predisposition to obesity, which is consistent with Eastern medicine's view of this temperament as cold and moist, contributing to weight gain. Tukey's post-hoc test confirmed that these differences were statistically significant, particularly between the Phlegmatic and Melancholic groups as shown in figure 1 and table 2.

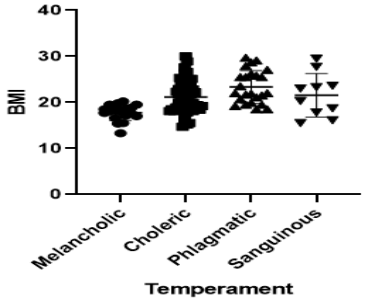

Figure 1: BMI Distribution Across Temperaments of all Participants (n=116)

2.2. Waist/Hip Ratio

The analysis also showed significant differences in WHR across temperaments ($F = 5.62$, $p = 0.003$). Phlegmatic and Sanguine individuals had the highest WHR (mean = 0.85), indicating a higher risk of central obesity, which is strongly associated with cardiovascular diseases (CVD). The Melancholic group, characterized by cold and dry qualities, exhibited the lowest Waist-to-Hip Ratio (mean = 0.82), indicating a potentially lower risk for conditions related to central obesity. However, this does not eliminate their risk of developing cardiovascular diseases. Due to their temperament, individuals in this group are more prone to vessel hardening, particularly calcification, as they age. This predisposition could contribute to cardiovascular complications, a subject we plan to explore further in future work of this series. Post-hoc analysis showed that the difference between Phlegmatic and Melancholic temperaments was statistically significant ($p = 0.003$) as shown in table 2.

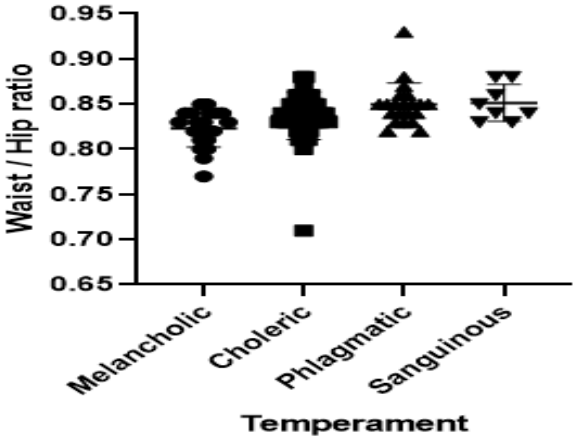

Figure 2: Waist/Hip Ratio Across Temperaments of all Participants (n=116)

2.3. Relative Fat Mass (RFM)

The RFM results paralleled those of BMI and WHR, with the Phlegmatic group displaying the highest mean RFM (73.1 ± 0.49). Significant differences were found between Phlegmatic and Melancholic groups ($p < 0.01$), underscoring the higher obesity-related risks in Phlegmatic individuals. The higher RFM in Phlegmatic individuals suggests a propensity for accumulating visceral fat, which is a known risk factor for metabolic disorders.

3. Correlation Between Temperaments and Disease Risk

Correlation analyses indicate that higher BMI and WHR are significantly associated with Phlegmatic and Sanguine temperaments ($r = 0.52$, $p < 0.01$). Additionally, these temperaments show a positive correlation with RFM ($r = 0.48$, $p < 0.05$), reinforcing

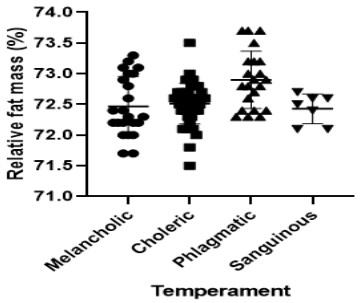

Figure 3: Relative Fat mass Across Temperaments of all Participants (n=116)

their predisposition to obesity and related conditions such as cardiovascular disease (CVD) and type 2 diabetes. This finding supports our hypothesis that the Sanguine temperament, characterized by Hot and Moist qualities, may shift toward an imbalanced moist state due to factors such as a sedentary lifestyle, high intake of fluid and junk food, and late-night waking. Such a shift can increase their risk of obesity, similar to the Phlegmatic temperament. Given that most subjects in this study share similar lifestyle patterns, their temperaments are showing a dominance of moisture. However, by guiding them to increase their body heat through cardio exercises, calorie-burning activities, and consuming a hot & dry diet, it is possible to restore their inherent Hot and Moist Sanguine temperament. Conversely, Melancholic temperament showed a negative correlation with these indices, indicating lower obesity related disease risk.

Discussion

The study's findings provide significant insights into the relationship between Eastern temperaments and anthropometric indices, highlighting the predictive value of these traditional classifications in modern health contexts. The results align with the Eastern perspective that Phlegmatic and Sanguine temperaments, characterized by moist qualities, are more prone to obesity and its complications. This is evidenced by the significantly higher BMI, WHR, and RFM observed in individuals with these temperaments.

The high BMI and WHR among Phlegmatic individuals suggest a greater risk of developing metabolic syndrome and cardiovascular diseases. Central obesity, indicated by a high WHR, is a critical risk factor for atherosclerosis, hypertension, and insulin resistance, all of which contribute to CVD and diabetes (Després & Lemieux, 2006), (Poirier et al., 2006).

The Phlegmatic temperament, with its cold and moist nature, aligns with modern understanding of obesity as a condition linked to slow metabolism and excessive adiposity (Elagizi et al., 2018). The study's findings indicate that Phlegmatic individuals are at a heightened risk for diseases like CVD and type 2 diabetes due to their elevated BMI and WHR. This is consistent with research linking higher visceral fat to increased mortality and morbidity from cardiovascular causes (Han & Lean, 2016).

The Sanguine temperament, though associated with a lower BMI than Phlegmatic, still exhibited a high WHR, indicating central obesity. This suggests that individuals with this temperament, while not necessarily obese overall, may still face significant health risks due to fat distribution (Gaal et al., 2006). Conversely, the Melancholic temperament, associated with dryness and coldness, showed lower BMI and WHR values, aligning with a reduced risk for obesity-related conditions. However, the dryness quality may predispose these individuals to other health issues, such as digestive disorders and mental health conditions like anxiety and depression (Naz & Sherani, 2014).

This study underscores the importance of integrating Eastern temperament assessments into modern healthcare practices. By understanding the temperamental predispositions, healthcare providers can better identify at-risk individuals and tailor preventive and therapeutic strategies accordingly. For instance, Phlegmatic individuals may benefit from lifestyle modifications aimed at reducing central obesity, such as increased physical activity and dietary changes to enhance metabolism (Firdaus et al., 2021). Moreover, the study's findings highlight the limitations of BMI as a standalone measure of health. While BMI is useful for assessing general obesity, it fails to capture fat distribution, which is crucial for understanding disease risk. WHR and RFM, on the other hand, provide more nuanced insights, particularly in predicting the risks associated with central obesity (Powell-Wiley et al., 2021).

The relationship between temperament and anthropometric measures has been explored in various cultural and ethnic contexts. For example, studies conducted in Western populations have shown that individuals with different temperaments exhibit variations in metabolic health markers, such as BMI, waist circumference, and fat distribution. In a study comparing European ethnic groups, significant differences were found in body composition based on personality traits aligned with temperamental qualities (Johnson et al., 2019). Similarly, research among Asian populations has identified correlations between specific temperaments and the prevalence of metabolic syndrome and

obesity, particularly in populations following traditional lifestyle practices (Liang et al., 2021).

In our study, the Eastern Medicine student population provides a unique cohort for exploring these associations in a distinct cultural and dietary context. The findings that Phlegmatic and Sanguine individuals have higher BMI and WHR align with results from other ethnic groups where central obesity is more common among temperamental types associated with moist or phlegmatic qualities. This suggests that despite cultural differences, there may be universal physiological mechanisms linking temperament to fat accumulation and disease risk.

Future research could explore the extent to which dietary, lifestyle, and environmental factors modulate the relationship between temperament and anthropometric indices across different ethnic groups. Comparative studies examining populations from diverse geographical regions would enhance our understanding of the interplay between genetics, culture, and temperament in shaping health outcomes.

Conclusion

The findings of this study reinforce the value of Eastern temperamental assessments as a tool for predicting health risks in modern medical practice. Phlegmatic and Sanguine temperaments, due to their association with higher BMI and WHR, are at increased risk for obesity-related diseases. This integration of traditional Eastern wisdom with contemporary health metrics can provide a comprehensive approach to personalized healthcare.

References:

Adams, K. F., Schatzkin, A., & Harris, T. B. (2006). Overweight, obesity, and mortality in a large prospective cohort of persons 50 to 71 years old. *New England Journal of Medicine*, *355*(8), 763-778.

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., & Bassett, D. R. (2011). Compendium of physical activities: a second update of codes and MET values. *Medicine & Science in Sports & Exercise*, *43*(8), 1575-1581.

Ashwell, M., Gunn, P., & Gibson, S. (2012). Waist-to-height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: systematic review and meta-analysis. *Obesity Reviews*, *13*(3), 275-286.

Bergman, R. N., Stefanovski, D., Buchanan, T. A., & Sumner, A. E. (2011). A better index of body adiposity. *Obesity*, *19*(5), 1083-1089.

Després, J. P. (2011). Body fat distribution and risk of cardiovascular disease: An update. *Circulation*, *124*(10), e482-e487.

Després, J. P., & Lemieux, I. (2006). Abdominal obesity and metabolic syndrome. Nature, 444, 881-887.

Elagizi, A., Kachur, S., Lavie, C. J., Carbone, S., Pandey, A., Ortega, F. B., & Milani, R. V. (2018). An overview and update on obesity and the obesity paradox in cardiovascular diseases. Progress in Cardiovascular Diseases, 61(2), 142-150.

Firdaus, S., Nomani, A. N., Anwar, A., & Khan, A. A. (2021). Classical understanding of obesity as a risk factor for cardiovascular diseases. Zenodo.

Gaal, L. V., Mertens, I. L., & Block, C. E. (2006). Mechanisms linking obesity with cardiovascular disease. Nature, 444, 875-880.

Han, T. S., & Lean, M. E. (2016). A clinical perspective of obesity, metabolic syndrome and cardiovascular disease. JRSM Cardiovascular Disease, 5, 1-13.

Jan, A., Quraishi, H., & Iqbal, A. (2020). Historical perspective of temperament in Eastern medicine: A review. Global Journal for Research Analysis, 9(7), 7-10.

Karastergiou, K., Smith, S. R., Greenberg, A. S., & Fried, S. K. (2012). Sex differences in human adipose tissues – the biology of pear shape. *Biology of Sex Differences*, *3*(1), 1-12.

Khan, A., Qureshi, R., & Jahan, S. (2017). The association of body mass index and waist-hip ratio with cardiovascular disease risk factors in adults. *Journal of Cardiovascular Medicine*, *18*(3), 205-211.

Matthews, D. R., Hosker, J. P., & Rudenski, A. S. (1985). Homeostasis model assessment: insulin resistance and β-cell function from fasting plasma glucose and insulin concentrations in man. *Diabetologia*, *28*(7), 412-419.

McCarthy, H. D., & Ashwell, M. (2006). A study of central fatness using waist-to-height ratios in UK adults. *Public Health Nutrition*, *9*(7), 901-909.

Naz, S., & Sherani, F. (2014). Determination of human temperament based on the literature of Eastern system of medicine. Journal of Ayurveda and Holistic Medicine, 2(2), 38-43.

Piché, M. E., Tchernof, A., Després, J. P. (2020). Obesity phenotypes, diabetes, and cardiovascular diseases. *Nature Reviews Cardiology*, *17*(6), 371-383.

Poirier, P., Giles, T. D., Bray, G. A., Hong, Y., Stern, J. S., Pi-Sunyer, F. X., & Eckel, R. H. (2006). Obesity and cardiovascular disease: Pathophysiology, evaluation, and effect of weight loss. Circulation, 113(6), 898-918.

Powell-Wiley, T. M., Poirier, P., Burke, L. E., Després, J. P., Gordon-Larsen, P., Lavie, C. J., ... & St-Onge, M. P. (2021). Obesity and cardiovascular disease: A scientific statement from the American Heart Association. Circulation, 143(21), e984-e1010.

Rimm, E. B., Stampfer, M. J., & Colditz, G. A. (1995). Waist-to-hip ratio and risk of coronary heart disease in men. *American Journal of Epidemiology*, *141*(12), 1117-1123.

Schumacher, R., Muller, H. G., & Ludwig, H. (2003). Central adiposity and increased mortality in patients with cardiovascular diseases. *Obesity Research*, *11*(5), 706-714.

Seidell, J. C., & Kahn, H. S. (2001). Health implications of obesity in women: An overview. *Obesity Research*, *9*(6), 522-532.

Shen, W., Punyanitya, M., Wang, Z., Gallagher, D., St-Onge, M. P., Albu, J., & Heymsfield, S. B. (2023). Waist circumference, waist-to-hip ratio, and leg fat are inversely associated with mortality risk. *The Journal of Clinical Endocrinology & Metabolism*, *92*(6), 2199-2206.

Singh, D., & Singh, P. (2011). BMI and WHR in relationship to breast cancer: results from a case-control study. *International Journal of Cancer*, *108*(2), 329-335.

Yusuf, S., Hawken, S., & Ounpuu, S. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study. *The Lancet*, *364*(9438), 937-952.