Prevalence of Type 2 diabetes in South Asian population

Saanvi Hitlamani

1. Abstract

Type 2 Diabetes is a chronic disease affecting millions in America alone. So, upon seeing so many cases among the U.S. population, which consists of so many different backgrounds, I'm led to my question about how race can impact the probability of having Type 2 diabetes. As mentioned, diabetes can cause many complications regarding health, and can severely alter the lives of those diagnosed, so by knowing how risks differ by racial groups, we can properly attenuate issues and understand ourselves better. In this paper, I aim to specifically review the risk factors South Asian people have. So, in the United States when I compare concerns for diabetes in the South Asian Population to the Caucasian population, I notice that the prevalence of diabetes in Caucasians is generally less than the risk of a South Asian person. Some factors are believed to account for this difference, such as societal impact or evolution, and in this paper, I will be reviewing these factors. In the epidemiological field, several different studies have been opened, and I will refer to different works. The goal, as mentioned, is to avoid misinformation and create opportunities for understanding how prevalence of disease can impact or has impacted a population; as good knowledge regarding health leads to good health.

1. Background

Diabetes is described by the World Health Organization (1) as a "chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces." There are different forms of diabetes, for example, a patient diagnosed with Type 1 Diabetes has a pancreas that cannot produce insulin while another diagnosed with Type 2 cannot process the produced insulin. Or, more specifically, those diagnosed with Type 2 Diabetes have "cells that don't respond regularly to insulin, also referred to as insulin resistance," as stated in an article titled Insulin Resistance and Diabetes (2) by the CDC. This makes the pancreas produce more insulin in an attempt to make the cells respond but end up causing blood sugar to rise, which if not treated can lead to permanent damage to the body. One of the more notable differences is that Type 2 Diabetes is often the result of lifestyle choices. I will review different studies that play roles in determining which predetermined factors or everyday choices lead to an increase in South Asians with diabetes.

1. Introduction

South Asian people are more prone to Type 2 diabetes, with India having a large population of diagnosed diabetics. Another way we can see this issue is how Times of India (3) describes it, by stating that "India is often described as the 'Diabetes Capital of the World,' as it accounts for 17% of percent of the total number of diabetes patients worldwide." We must also understand that this doesn't include the staggering percentage of the population that is undiagnosed. Diabetes is a dangerous chronic condition, being the eighth leading cause of death in the U.S (to the American Diabetes Association) and the earlier you understand the risks you face, the earlier you can take preventive measures- but with so many South Asians undiagnosed, they face the dangers of diabetic complications. There are many risks to leaving diabetes untreated such as kidney failure or high blood sugar. The goal is to bring more understanding and awareness to how dangerous Type 2 diabetes can be and to encourage people of South Asian descent to learn about their risks and take necessary measures.

However, while South Asian people are more vulnerable to this disease, we also need to understand why this could be occurring. In this day and age, people have different living conditions: their food, their exercise, their stress levels, and other factors are generally changing which could be contributing to this diabetes epidemic in Indians. There is an article from the MASALA (4) study that talks about modifiable risk factors; how South Asians were generally more susceptible to conditions like type 2 diabetes because of lifestyle and the risks these choices present (5). Overall, South Asians are more prone to type 2 diabetes, and the understanding of why is because both predetermined biological elements led to this and modern-day elements and decisions that add to the issue.

1. **Key Findings**

"Why are South Asians prone to type 2 diabetes? A hypothesis based on underexplored pathways," (6) is an article published by Springer Link (March 2021) and written by KMV Narayan, a well-acclaimed epidemiologist with several works regarding our topic, and by Alka M. Kanaya. In this article, the authors stated in their abstract that, "South Asians have a higher prevalence of type two diabetes, even at a lower BMI." BMI is defined as "a measure of body fat based on height and weight that applies to adult men and adult women" by the National Institute of Health (7). BMI is measured by the weight of a person (in kilograms) divided by their height in meters squared. It is seen that the higher BMI a person has, the higher their risk for Type 2 diabetes will be. However, for South Asian people, a lower BMI does not prevent or reduce their risk for diabetes. In a study by the National Institute for Health and Care research (8), they state that diabetes prevention should be sought for the South Asian population when one reaches a BMI of 24, whereas "a BMI of 24 would be considered healthy in a White population." So, if we say that lifestyle is responsible for this risk, we can foresee that, as NIHS states, "future generations might have different lifestyles than their parents, which could affect their risk of obesity." With future lifestyle changes comes a new set of risks, different from what we see now, but still the risk is continuously higher for South Asians than with Caucasians. In an article by the National Institute of Health regarding the prevention of diabetes in South Asians using lifestyle interventions (9), they state that "Among ethnic South Asians, factors such as migration and cultural values about diet and exercise have been observed to further compound the rising prevalence of T2DM." In this reference, the abbreviation T2DM refers to Type 2 Diabetes Mellitus, another term for adult onset diabetes.

So firstly, regarding diet, a common mindset regarding South Asian diets is to view them as fundamentally healthy- and South Asian cuisine does involve a good intake of grain, fruits, and vegetables. Additionally, a large population of South Asians practicing vegetarian diets, like said in an article by the National Institute of Health regarding how diets, like veganism or vegetarianism, in a region of Karnataka influenced the prevalence of type 2 diabetes described as providing more protection against type 2 diabetes (10); "The results show that increased conformity to vegetarian diets protected against risk of type 2 diabetes." Those who are vegetarians also tend to have a low BMI, which as we mentioned earlier generally lowers the risk for type 2 diabetes. However, regarding migration, South Asian people who no longer live in a South Asian country, take to other foods common to the region they are in. We can see this in an article regarding diabetes care for South Asians in the US (11), they state that, "Although local, regional, and country-level differences in South Asian diet exist, there are similarities in diet across South Asian countries and is mostly comprised foods with high glycemic indexes, both from traditional foods and the adoption of Westernized foods." The Western diet is

associated with foods that are high in sodium, high in fat, and high in calories. Or, as stated in an article published by the National Library of Medicine (12), “The Western diet consisted of foods high in fats and sugars and low in fiber.” So, the added consumption of the generally unhealthy or possibly leading to obesity Western diet (the Western diet specifically includes foods like red meats, candy, high fructose products, or high-fat dairy products) does not improve the negative aspects of the South Asian diet. While South Asian food is nourishing, with lots of fiber, a lot of the diet does include high glycemic foods, meaning foods like white rice which is a staple of the South Asian diet. The repeated consumption of glycemic foods, as said in an article by Matthew Solan in Harvard Health Publishing (13), “-may lead to weight gain and insulin resistance, factors associated with type 2 diabetes and higher cardiovascular risk.” Diet and exercise are two key factors in preventing type 2 diabetes, and a low amount of physical activity is a factor in developing type two diabetes- in an article by Stamatina Iliodromiti, Nazim Ghouri, Carlos A. Celis-Morales, Naveed Sattar, Mary Ann Lumsden, and Jason M.R. Gill published by the National Library of Medicine (14), they state that, “In particular, there is accumulating evidence that South Asians may have a ‘low fitness’ phenotype which contributes to their elevated cardio-metabolic risk, and thus may particularly benefit from undertaking higher levels of physical activity.” The lifestyle of many South Asians today does not include the recommended levels of physical activity and lower levels of physical activity do increase the risk for type 2 diabetes. In an article by the CDC (15), they state, “Not getting enough physical activity can raise a person’s risk of developing type 2 diabetes. Physical activity helps control blood sugar (glucose), weight, and blood pressure and helps raise “good” cholesterol and lower “bad” cholesterol.”

Consequently, physical activity is significant to the prevention of Type 2 diabetes, yet many South Asian people, as mentioned previously, do not meet the expected time for daily exercise. The reason as to why may lie in societal norms. An article in the National Library of Medicine regarding research done in Canada (16) explains how society influences physical activity in South Asian men and women. This article describes an activity in which they brought a group of adult South Asians and asked them questions regarding physical exercise and what physical exercise is to them. Quoting one female participant’s views; “The cooking that we do, that’s also exercise. When we stir the vegetables and when we are working in the garden, we bend, have some cultivation at home–or when we kneel to cut grass–and all this, although is not too much, is exercise nevertheless.” For many women, cooking or cleaning in their household is their responsibility, and it is difficult to find time to do other sorts of activities. Some count their chores as their daily exercise, while others view it as an obstacle preventing them from exercising. In an article published in the International Journal of Behavioral Nutrition and Physical Activity (17), it is stated, regarding the results of a survey that had been conducted, “Overall in the majority of studies females were more inactive compared to males, and this could be due to the aforementioned gender norms or family choices. Some societal norms revolve around the limitations placed on women; as said in the earlier article (16) - “several female participants (in the all-female group) attributed low levels of PA in South Asian women to the way they were brought up in India–the overall cultural influences that inhibited young girls from being physically mobile or getting good education in cities.” Now, regarding the men of this study, they generally had better knowledge of the time required for daily exercise. However, participation in active sports is not very popular among South Asian immigrants. One male participant (all-male group), talked about how his close friends and neighbors reacted to his interest in marathons upon arriving in Canada; “...My friends and pals and the neighboring- all around would say ‘Why

are you taking a risk, raise your kids. You are in Canada, raise your kids. You will break your leg, where will you go, your kids will starve and die.' And I am like why will they die?" His interest in running sparked lots of confusion and worry regarding his physical health while running provides more health benefits than negatives. It's important to state that many participants of both genders understood the importance of having an active lifestyle and enjoyed physical exercise. As said in the article, "Walking appeared to be the most popular exercise among the participants–especially those relatively older in age." However, it is not only the young or middle-aged persons who face difficulty in getting physical activity in their day-to-day lives, it is the elderly as well, due to cultural norms or family dynamics. Based on what was said in the article, "In South Asia, there is a strong culture of respect towards older people in general, including one's parents which is often manifested in serving them at all times. As such, adult children may unknowingly end up discouraging their elderly parents from performing light PA," or in other words, it is more respectful to let the elders rest or stay inactive; however, in an article by NIA (National Institute of Aging; (18), it's said that, "Often, inactivity is more to blame than age when older people lose the ability to do things on their own." Furthermore, in an article published by the National Library of Medicine (19), it is stated that: "Almost 4 in 10 middle-aged and older adults in India had inadequate physical activity." Taking notice of the risks that accompany an inactive lifestyle and taking measures to incorporate more physical exercise into daily life provides less risk for Type 2 diabetes, improves physical wellness but also improves mental health,

However, it is important to recognize that while lifestyle factors do have importance in how at risk some races are to some conditions, like how diet and exercise influenced type 2 diabetes in South Asians, oftentimes a race is naturally susceptible to a condition.

Referring back to KMV Narayan and Alka M. Kanaya's article (4), they've stated that other emerging epidemiological studies have provided data that "indicate that South Asians may have a lower ability to secrete insulin, and thus may have less compensatory reserves with unhealthy lifestyles." The lower ability to secrete insulin is not due to lifestyle changes and is generally seen as a result of different evolutionary measures. So, we must comprehend why the South Asian population have these features developed over time, which are- as said in the article- (1) ‘‘reduced beta cell function and (2) impaired insulin action owing to low lean mass, which is further accentuated by (3) ectopic fat deposition in the liver and muscle." So, starting with low lean mass; lean mass is the weight of the body taking away the added weight from fat mass [stored fat]. Low lean mass is common in South Asians, as said in a paper regarding a study done on Aboriginal, Chinese, European and South Asian men and women (20); "At any given body fat mass value, South Asians had significantly less lean mass than each of the three other groups after adjustment for age, height, humerus breadth, smoking status, physical activity, and diet." So, to see where low lean mass originated, we must look from the early beginnings- and in our aforementioned article (4) they've viewed South Asian skeletons that show signs of low lean mass as it was a characteristic of that time. Afterwards, it was stated that "Historical data suggest that the South Asian population may have had good nutrition status in the Mesolithic period, as indicated by their relative tallness during that time [15]. However, since then, the population may have become increasingly undernourished for generations, and this may have become more pronounced during the period of British colonisation of the subcontinent [16]. In other words, as the environment surrounding South Asian people changed, their metabolic capacity also changed. These changes led to things such as, "poor insulin secretion, ectopic fat deposition and low lean mass." As previously stated, insulin resistance and poor insulin

secretion are both conditions relating to the pancreas & differentiate Type 2 Diabetes from Type Now, to define 'ectopic fat deposition in the liver and muscle'- as said in an article by the National Institute of Health (21); "Ectopic fat is defined as storage of TG in tissues other than adipose tissue, that normally contain only small amounts of fat, such as the liver, skeletal muscle, heart, and pancreas. Ectopic fat can interfere with cellular functions and hence organ function and is associated with insulin resistance." To put this in other words, ectopic fat deposition is when triglycerides, referred to as TG in the article, are deposited in cells that do not regularly contain more than small amounts of fat. Additionally, poor beta cell function is relative to impaired insulin secretion- this statement is further explored in an article by the National Institute of Health (23) when stated, "β-cell dysfunction is present at the diagnosis of T2DM and progressively worsens with disease duration. β-cell dysfunction is associated with worsening of glycemic control and treatment failure; thus, it is important to preserve or recover β-cell functional mass in the management of T2DM." Or, to put it in different words, in this article, it is said that the dysfunction of β-cells, being beta cells, is tied to the diagnosis of Type 2 Diabetes. Additionally, the poor cell function of these beta cells gets worse over time- meaning these cells are important regarding Type 2 diabetes and their poor quality can lead to these issues.

Conclusion

Overall, my key findings from our sources review that South Asians are very susceptible to Type 2 diabetes. This is due to our aforementioned factors; such as societal factors and lifestyle decisions. For example, the food that many South Asian people eat / the diet of South Asian people adds to the risk factors and the cultural norms or family dynamics that limit daily activity are also important. The way that BMI impacts South Asian people is a factor they could not control; like how the lower ability to secrete insulin was a result of many factors. So, to summarize, factors such as poor beta cell function and low muscle mass are two evolutionarily determined factors that can cause impaired insulin secretion and add to increased Type 2 diabetes susceptibility. Then, in response to the type of lifestyle led by the individual, ectopic fat deposition can lead to affected insulin action, contributing to Type 2 diabetes susceptibility. It can be concluded that many components lead to a higher risk for Type 2 diabetes; some factors being caused by lifestyle, some factors in response to lifestyle & some factors predetermined.

1. References

1. Diabetes, World Health Organization, (2023, April 5), https://www.who.int/news-room/fact-sheets/detail/diabetes#:~:text=Diabetes%20is%20a%20chronic%20disease,hormone%20that%20regulates%20blood%20glucose
2. Insulin Resistance and Diabetes, Center for Disease Control, (Reviewed 2022, June 20) https://www.cdc.gov/diabetes/basics/insulin-resistance.html,
3. Why India is diabetes capital of the world, Times of India, (2022, November 14) https://timesofindia.indiatimes.com/india/why-india-is-diabetes-capital-of-the-world/articleshow/95509990.cms
4. The MASALA study - https://www.masalastudy.org/
5. Kanaya Alka, THE TIMES OF INDIA: BI-CULTURAL AND ASSIMILATED SOUTH ASIANS HEALTHIER THAN THOSE WITH MORE TRADITIONAL HABITS: DR.

ALKA KANAYA, The Masala Study, (2024, January 21) https://www.masalastudy.org/blog/2024/1/22/the-times-of-india-bi-cultural-and-assimilated-south-asians-healthier-than-those-with-more-traditional-habits-dr-alka-kanaya

6. Narayan, K.M.V., Kanaya, A.M. Why are South Asians prone to type 2 diabetes? A hypothesis based on underexplored pathways. *Diabetologia* **63**, 1103–1109 (2020). https://doi.org/10.1007/s00125-020-05132-5
7. Calculate Your Body Mass Index, National Heart, Lung and Blood Institute, https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm#:~:text=Body%20mass%20index%20(BMI)%20is,to%20adult%20men%20and%20women
8. Rishi Caleyachetty, PhD, et al. Ethnicity-specific BMI cutoffs for obesity based on type 2 diabetes risk in England: a population-based cohort study, (2021, May 11) https://doi.org/10.1016/S2213-8587(21)00088-7
9. Ali, Shahmir H et al. “Preventing type 2 diabetes among South Asian Americans through community-based lifestyle interventions: A systematic review.” *Preventive medicine reports* vol. 20 (2020): 101182. doi: 10.1016/j.pmedr.2020.101182
10. Sarwar Zaman, Gaffar et al. “Comparative risk of type 2 diabetes mellitus among vegetarians and non-vegetarians.” *Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine* vol. 35,3 (2010): 441-2. doi: 10.4103/0970-0218.69285
11. Shatabdi Goon, MSc, Karen Chapman-Novakofski, PhD, RD, Call for Cultural and Language-Concordant Diabetes Care, Nutrition Education, and Self-Management for South Asian Individuals Living in the US, (2023, November 6) https://doi.org/10.1016/j.jneb.2023.10.004
12. Rakhra, Varundeep et al. “Obesity and the Western Diet: How We Got Here.” *Missouri medicine* vol. 117,6 (2020): 536-538. \https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7721435/#:~:text=The%20western%20diet%20is%20also,density%20lipoproteins%20leading%20to%20atherosclerosis
13. Solan, Matthew, High Glycemic diets could lead to big health problems, (2021, July 1) https://www.health.harvard.edu/staying-healthy/high-glycemic-diets-could-lead-to-big-health-problems
14. Iliodromiti, Stamatina et al. “Should Physical Activity Recommendations for South Asian Adults Be Ethnicity-Specific? Evidence from a Cross-Sectional Study of South Asian and White European Men and Women.” *PloS one* vol. 11,8 e0160024. 16 Aug. 2016, doi: 10.1371/journal.pone.0160024
15. Physical Activity, CDC, https://www.cdc.gov/chronicdisease/resources/publications/factsheets/physical-activity.htm#:~:text=Not%20getting%20enough%20physical%20activity%20can%20lead%20to%20heart%20disease,cholesterol%2C%20and%20type%202%20diabetes
16. Mahmood, Bushra et al. “'We just don't have this in us…': Understanding factors behind low levels of physical activity in South Asian immigrants in Metro-Vancouver, Canada.” *PloS one* vol. 17,8 e0273266. 25 Aug. 2022, doi: 10.1371/journal.pone.0273266

17. Ranasinghe, C.D., Ranasinghe, P., Jayawardena, R. *et al.* Physical activity patterns among South-Asian adults: a systematic review. *Int J Behav Nutr Phys Act* 10, 116 (2013). https://doi.org/10.1186/1479-5868-10-116
18. Real-Life Benefits of Exercise and Physical Activity, National Institute of Aging, https://www.nia.nih.gov/health/exercise-and-physical-activity/real-life-benefits-exercise-and-physical-activity
19. Pengpid, Supa, and Karl Peltzer. “Prevalence and associated factors of physical inactivity among middle-aged and older adults in India: results of a national cross-sectional community survey.” *BMJ open* vol. 12,8 e058156. 26 Aug. 2022, doi: 10.1136/bmjopen-2021-058156
20. Lear, Scott A., et al. "Ethnic variation in fat and lean body mass and the association with insulin resistance." *The Journal of Clinical Endocrinology & Metabolism 94.12 (2009): 4696-4702.* doi: https://doi.org/10.1210/jc.2009-1030
21. Snel, M et al. “Ectopic fat and insulin resistance: pathophysiology and effect of diet and lifestyle interventions.” *International journal of endocrinology* vol. 2012 (2012): 983814. doi: 10.1155/2012/983814
22. Yki-Järvinen, Hannele. “Ectopic fat accumulation: an important cause of insulin resistance in humans.” *Journal of the Royal Society of Medicine* vol. 95 Suppl 42,Suppl 42 (2002): 39-45.
23. Saisho, Yoshifumi. “β-cell dysfunction: Its critical role in prevention and management of type 2 diabetes.” *World journal of diabetes* vol. 6,1 (2015): 109-24. doi: 10.4239/wjd.v6.i1.109