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(RESEARCH ARTICLE)

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Teenagers' future diabetes risk perception

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Abstract

Asians are often thought to have a poor ability to predict their future risk of diabetes. We studied perceptions of Type 2 diabetes future risk in middle school and high school students. All students watched two short videos about Body Mass Index (BMI) and diabetes. Afterwards, 300 students, ranging from 7th to 10th graders, took a short survey in their physical education classes. The survey gauged basic knowledge about diabetes, BMI, their view on their future risk of diabetes and asked them about various risk factors. Contrary to common thought, Asian students understood that they might have a higher risk than their non-Asian counterparts, and many responses in the survey suggest that they knew about diet differences and other cultural factors that account for the difference in risk.

Keywords: Diabetes; Youth; Asian Diabetes Risk; Body Mass Index; Risk Factors

1. Introduction

Although Type 2 Diabetes (T2D) primarily affects the middle-aged population, there is a growing prevalence of prediabetes in adolescents. Two in five adolescents are pre-diabetic (Andes et al., 2019; CDC, 2020). being prediabetic as an adolescent indicates a high risk for developing diabetes as an adult (Andes et al., 2019; Haemer et al., 2014). The prevalence of prediabetes amongst adolescents is likely due to rising obesity rates (Andes et al., 2019). Organizations like The American Diabetes Association also cite the main risk factor for diabetes as obesity and elevated weight (Wu et al., 2014).

Body mass index (BMI) is most frequently associated with incorrect risk perceptions (Brawarsky et al., 2018). Participants in some studies strongly associated a high BMI with a higher risk of developing diabetes, but this is not always the case. Most importantly, a vast gap in all of the studies was the lack of an Asian population. It is assumed that Aisans have a lower self-perceived risk since they tend to have a lower BMI. Yet they have a high risk of diabetes (Brawarsky et al., 2018). Asians are one of the groups with the largest prevalence of diabetes across race and notably have the largest percentage of undiagnosed diabetes cases. Asians generally have a lower BMI and appear to be less obese than their counterparts of other races, while they actually have a higher body fat percentage (Wang et al., 1994).

We wanted to know if younger Asians correctly perceived their future risk of diabetes. Observing Asian teens' perceptions of their future risk could enable the implementation of effective educational programs and also bring awareness about the risk of diabetes, despite their lower weight and comparatively thinner appearance.

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2. Method

The study was conducted at Uplift North Hills Preparatory, a Kindergarten to 12th Grade school in Irving, TX. Most notably, the school is known for being diverse in terms of economic status and cultural backgrounds of the students. This study was approved by an Institutional Review Board.

The head instructor of the physical education sent emails to the parents of the students explaining the study and instructions on how to opt out of the study if so desired. The study was conducted over two days.

Students in the 7th to 10th grade watched two informational videos (refer to Appendix B) and took a survey (refer to Appendix A). The videos were included to provide uniform information to students regarding the topics of BMI and T2D. The survey was conducted after watching the video and examined their perceptions of risk factors and how students rate their own future risk of diabetes using the information they learned in the educational videos.

Responses that were incomplete and nonsensical were removed. A two-tailed, non-paired, t-test was performed on the risk level (RL) ratings for Asians and Non-Asians. A p-value of less than 0.05 was considered significant.

3. Results

The complete number of participants in the study was 317. Out of this, 197 identified as Asian and 120 identified as a race other than Asian (non-Asian). No students were eliminated from the study, though some individual answers were.

Table 1 Percentage distribution of whether or not students in the Asian and Non-Asian population had knowledge of diabetes and BMI

	Asian (n = 197)	**Non-Asian (n = 120)**
Knowledge of Diabetes (% yes)	196 (99.5%)	119 (99%)
Knowledge of BMI (% yes)	130 (66%)	67 (56%)

Table 1 Shows percentage distribution of whether or not students in the Asian and Non-Asian population had knowledge of diabetes and BMI. Nearly all the students reported that they knew what diabetes was, and a slightly higher percentage of the Asian students reported that they knew what BMI was compared to the Non-Asian students. There was no statistically significant difference between to two groups.

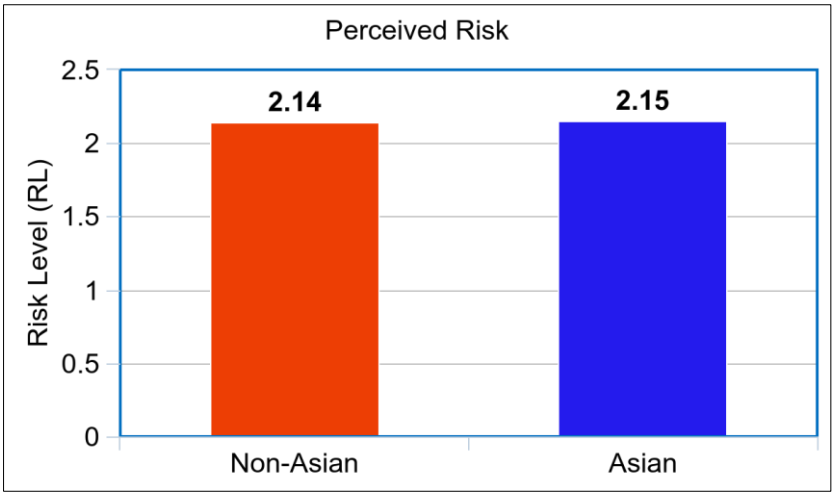

Figure 1 Asian and Non-Asian average Risk Level (RL) ratings. Predictions of Asian and Non-Asian Risk Levels are around the same between the populations. The y axis is measured in percent total and the data labels on the bars are raw counts.

Asian students' prediction of their future risk of diabetes was nearly identical to non-Asian students, averaging 2.1 (with 1 as least likely and 5 as most likely to contract diabetes in the future). This suggests that Asian students did not

underestimate their risk, contrary to the initial hypothesis. The t-score was 0.0076 and p-value was 0.9939, giving strong evidence that there is no statistically significant difference between the groups.

We further subdivided students by their BMI using the categories Low, Healthy and Overweight. These categories were derived from the NIH website (Nuttall, 2015). Contrary to our hypothesis, Asian students from each BMI group represented their risk higher than their Non-Asian counterparts (figure 2). The y axis is measured in percent total and the data labels on the bars are raw counts. For example, for overweight Asians, the majority ranked themselves as a 3 (medium risk) and none ranked themselves as high risk. None of the BMI overweight non-Asian population ranked themselves as high risk either. 84% rated their future risk of diabetes as 4 or 5, while 58% of non-Asians in the same weight category rated their future risk as a 4 or a 5. Even among Asians with a healthy BMI, who we hypothesized would underestimate their risk of diabetes, 82% rated their future risk as 2,3 or 4, while 68% of non-Asians in the same BMI category rated their future risk as 2,3 or 4.

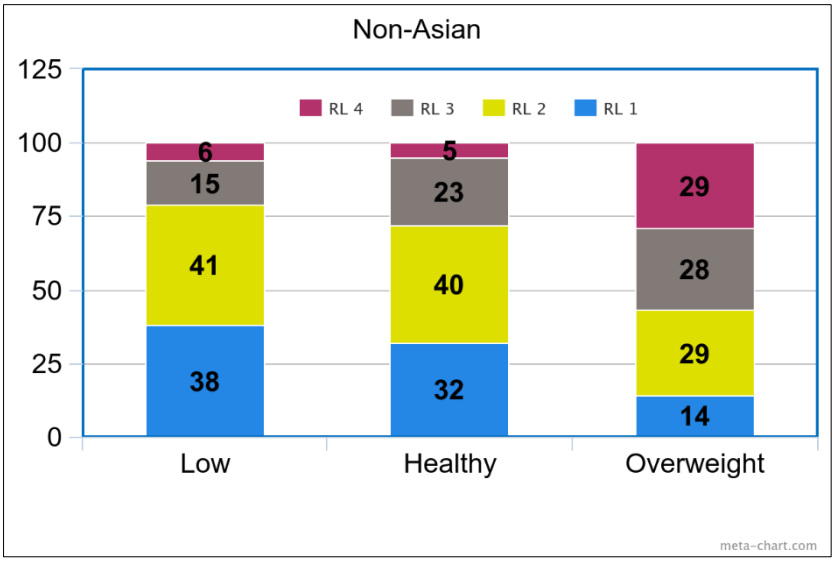

Figure 2a Distribution of self-selected RL compared to measured BMI for non-Asians

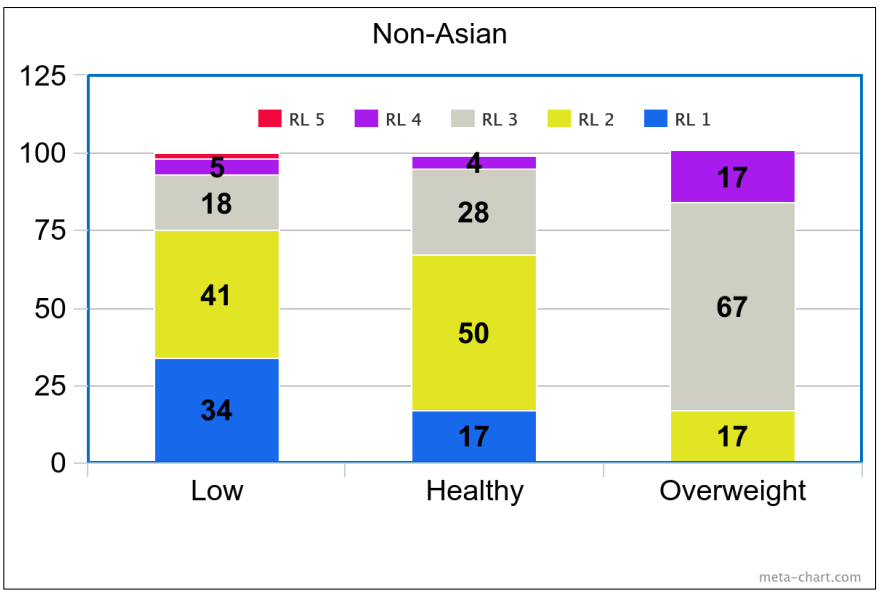

Figure 2b Distribution of self-selected RL compared to measured BMI for Asians

One possible explanation for Asians rating their risk higher than non-Asians is that they have a poor understanding of the disease. We considered students to have "no understanding" of diabetes if they thought two non-relevant factors ("Using electronic devices excessively" and "Not having good hygiene") contributed to diabetes risk. All others were considered to have an understanding of diabetes. Understanding seemed to be similar across Asians and non-Asians, with less than a two percentage point difference (no significance, Figure 3).

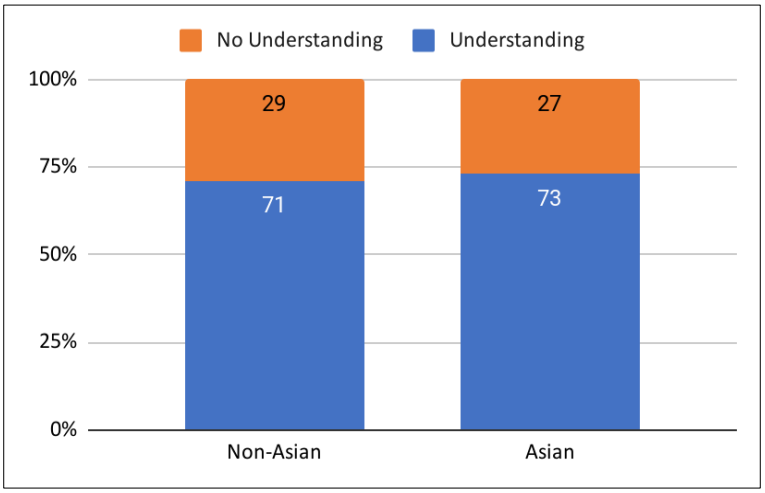

Figure 3 Understanding of Diabetes Risk Factors by Race

We directly tested whether Asian children understood that their ethnicity put them at a higher risk. Although there was no statistically significant difference between the groups, Asians did correctly identify their ethnicity as placing them at higher risk (Figure 4).

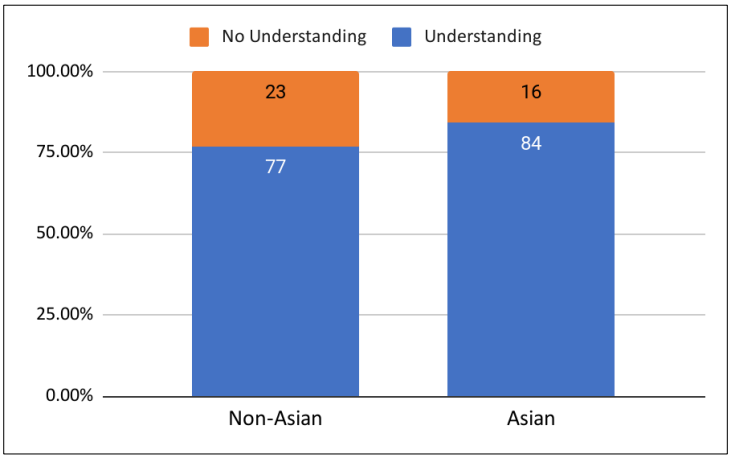

Figure 4 Overall, Asian students had a greater understanding that race plays an important role in risk for diabetes.

Students were also asked about their race in a free response style question and how that could affect their risk. Two students wrote:

"I am Indian. I do believe that my race increases the risk of me having diabetes. I learned that apparently it is very easy for indian [sic] people to get diabetes since our bodies duplicate any sugar we consume. This is due to India going through 3 famines. Our bodies have adapted to taking carbs and duplicating it just in case there was another famine. " (8th grader)

"I am Indian, and in my heritage almost all of my ancestors and family members had or have diabetes. It does increase my risk but my mother has told me that we have different life styles and there are ways to prevent it." (7th grader)

Asian students are not only aware of their increased risk, but also know the cultural differences in lifestyles between their family and others.

4. Discussion

We assumed that Asian students would underestimate their risk of diabetes. But this was not the case.

Almost all students knew what diabetes was, but more Asian students knew about the role of BMI. Across all BMI categories, Asian students and non-Asian students rated themselves comparably when asked about their risk of developing diabetes. Additionally, after splitting the students by BMI levels, Asians correctly identified themselves as being at higher risk, even if they had a healthy BMI.

Comparatively, Asians predicted their future risk as slightly higher compared to their non-Asian counterparts. Nobody ranked themselves as the highest risk except for one person in the lowest BMI group, however, this might simply be due to random selection. However, no BMI overweight Asians ranked themselves at the lowest risk level while some non-Asians did, perhaps showing that Asians recognize that they have basically the same risk level even though their BMI is lower. BMI healthy, Asians place themselves at slightly higher risk (at around risk levels one and two). More non-Asians than Asians in the BMI overweight group put themselves at the second-highest risk level, and none put themselves at the highest. But in general, their ratings seem to correlate with the risk associated with their BMI group.

The difference in perception was not due to a misunderstanding of the disease. For the question that required students to rank the influence of various risk factors on the risk of diabetes, each group recognized and similarly ranked risk factors. On the contrary, Asians had a good understanding that race is a risk factor for diabetes and therefore recognized that being Asian had an impact on their future diabetes risk.

The findings in this paper do not support the hypothesis that Asian students will underestimate their risk of T2D. Our data shows that the Asian students and non-Asian students ranked their future risk of diabetes similarly. Asians are in fact getting information from family and gaining cultural consciousness. Thus, Asians of this generation are educated on their relatively large future risk of diabetes. It is probable that this is because of discussions happening within their communities. There is a large Asian population and numerous cultural centers in Irving, TX. Thus, Asian people can talk about their health issues, empathize with each other and compare risk factors and symptoms. The increase in cultural dialogue can help Asians pinpoint certain aspects of their identity, such as diet and culture, that affect their future risk of T2D. They can then relate that to their experiences with diabetes, which they share with their children.

Limitations

A larger sample size would likely have shown some of the fundamental findings of this paper to be statistically significant. Some students could have answered the questions randomly or falsely, further confounding the statistics. However, students completed the survey thinking it was a quiz (though the papers were anonymous) for their Physical Education class, suggesting that most answered accurately. The BMI calculations might be inaccurate as students might not have known their height or weight or did not feel comfortable sharing them, even anonymously.

5. Conclusion

Asian students are learning about their increased future risk of diabetes, most likely from parents and family. If further study confirms that the source of their knowledge is their family, it would suggest that those without access to this information - orphans, adopted children, weak family structures - may be at an increased risk of misestimation of their diabetes risk. Perhaps public health websites could help close this gap by making specific, race-related disclaimers in their BMI-diabetes information.

In order to bridge this gap, especially for Asian students without this special knowledge from their families, it would be beneficial to educate people on the increased risk for diabetes in the Asian population in the form of lesson plans in schools as a part of health or physical education classes. Also including a disclaimer in widely-used diabetes websites on the BMI differences between Asians and Non-Asians would be very instrumental in helping Asians realize their actual risk of diabetes. Many websites that give information on T2D include BMI ranges that present more risk for T2D, but do not include the important detail that Asians have different BMI thresholds in the risk of diabetes.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Appendix

A: Survey

What grade are you in?

- 7
- 8
- 9
- 10

Do you know what diabetes is?

- Yes
- No

Do you know what Body Mass Index is?

- Yes
- No

In the 2nd video we watched, we learned that race has a factor in diabetes risk. What race do you identify with, and do you think it increases or decreases your future risk of diabetes?

- Enter your height in inches
- Enter your weight in pounds
- (BMI appears here)

Rate the following risk factors for diabetes, with 1 being the most influential to 8 being the least influential in increasing chances for getting diabetes

- Having parents or grandparents who have diabetes
- Eating too much sugary foods
- Not exercising
- High BMI
- Using electronic devices excessively
- Racial or Ethnic Background
- Not having good hygiene

Family wealth and status

- In a scale of 1-5 (1 being not likely, 5 being likely), rate your likelihood of getting diabetes in the future
- (If the participant selected "1" or "2")
- I am part of a higher socioeconomic group
- My BMI is low
- My relatives don't have diabetes
- I eat healthy foods
- I exercise regularly
- My race is not affected by diabetes as much
- (If the participant chooses response "4" or "5")
- I am part of a lower socioeconomic group
- My BMI is high
- My relatives have diabetes
- I eat unhealthy foods
- I don't exercise often
- My race is largely affected by diabetes
- (If the participant chooses response "3")
- I am part of a middle socioeconomic group
- My BMI is healthy
- A very small amount of my relatives have diabetes
- I eat unhealthy foods and healthy foods
- I exercise sometimes
- My race is slightly affected by diabetes

B: Videos

CNN video on BMI:

Why Your BMI Matters. CNN. 2017 Oct 10 [accessed 2024 Jan 5]. https://www.cnn.com/videos/health/2017/10/10/bmi-body-mass-index-sje-lon-orig.cnn/video/playlists/your-health/

CDC video on risk factors of diabetes:

Know the Risk Factors. Centers for Disease Control and Prevention; 2016.

https://www.youtube.com/watch?v=d-6wHMHm20I