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Authors

Khangura, Maya
Maiyuran, Nishani
Pandita, Prisha
et al.

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Relationship between Blood Pressure and Blood Sugar Levels with Primary Care Visit Frequency, Preventative Care Frequency, and Medical History on the Punjabi Patient Population in Sacramento County

Maya Khangura, Nishani Maiyuran, Prisha Pandita, Raj Singh, Anwesh Sahu, Armaan Singh, Baljeet Dhaliwal, Vanshica Sharma, Mahnoor Rizwan, Chehakdeep Kaur

Electronic Medical Record Committee of the Bhagat Puran Singh Health Initiative, University of California, Davis Chapter

Introduction

The Punjabi population is a growing demographic in California, especially within Sacramento County. While healthcare and preventative medicine have improved substantially over the past decades, it is still important to recognize that many immigrant and minority communities, such as the Punjabi population, face challenges in accessing preventative care or managing chronic conditions, with examples being hypertension and diabetes mellitus. Preventative medicine is the medical practice of preventing the occurrence of diseases or illnesses by taking proactive steps towards managing current health. Annual check ups are an essential part of preventative medicine, however a majority of the general population are not able to visit their primary care physician. This phenomenon is exacerbated in underserved communities due to lack of insurance, language barriers, medical deserts, lack of cultural competence, and fear of judgment or dismissal from their provider (Chen et al., 2017). Previous research has shown that Punjabi and broader South Asian populations may have higher risk of developing metabolic disorders, including type two diabetes mellitus, hypertension, and hyperlipidemia (Wolf et al., 2020). Hypertension is the third most common risk factor in South Asian deaths, and hypertension rates are projected to steadily increase over time (Anchala et al., 2014). Preventative healthcare and healthcare education targeting hypertension and other risk factors have the potential to save lives. Regular primary care physician (PCP) visits, consistent monitoring of blood pressure and glucose levels, and cancer screenings such as mammograms and prostate exams can help support better long term health outcomes within the Punjabi and broader South Asian populations.

However, data regarding the frequency of preventative care habits in South Asian communities in America remains limited. Through the utilization of self-report questionnaires,

we will record patient blood pressure and glucose levels, as well as their medical history, PCP visit and preventative care frequencies. This study aims to evaluate the association between these intersecting factors, while centralizing the Punjabi population of Sacramento County. Through this, we wish to inform healthcare providers of the specific issues that affect our local Punjabi population, and push for further research efforts.

Methods

This study used a retrospective, observational design to examine the relationship between blood pressure, blood sugar levels, healthcare utilization, preventive care, and medical history among Punjabi adult patients seen at Bhagat Puran Singh Health Initiative clinics in Sacramento County. The study population included patients aged 18 years and older who received services through BPSHI between September 2025 and March 2026.

Data was collected from BPSHI clinic intake forms, patient health history forms, and clinical measurements recorded during clinic visits in the Practice Fusion EHR. The primary clinical variables of interest were blood pressure and blood sugar levels. Blood pressure was recorded as systolic and diastolic values via blood pressure cuff, while blood sugar levels were recorded in milligrams per deciliter when available as part of routine clinic screening. Additional variables included primary care provider visit frequency, preventive care frequency, and relevant medical history. Medical history included patient-reported chronic conditions, previous diagnoses, and other health concerns documented during the clinic encounter.

This study focused on Punjabi patients receiving care at community-based BPSHI clinic sites in Sacramento County. BPSHI clinics all take place at Gurdwaras, which are places of worship and community for the Sikh community (the Sikh community is primarily Punjabi, and

this was reflected in our data). These clinics provide basic health screenings, vitals collection, health education, and referrals for community members who may experience barriers to consistent healthcare access. Because the study used existing clinic data, participants were included if they were over the age of 18, identified as part of the Punjabi patient population served by BPSHI, and had relevant clinical or intake information documented during the September 2025 to March 2026 data collection period.

The analysis examined how blood pressure and blood sugar levels varied in relation to primary care visit frequency, preventive care frequency, and medical history. Descriptive statistics were used to summarize patient characteristics, clinical measurements, healthcare utilization patterns, and reported medical history. Blood pressure and blood sugar values were then compared across categories of primary care use, preventive care use, and medical history to identify patterns in health and healthcare engagement among Punjabi adult patients in Sacramento County.

Results:

To find a trend or relationship between the blood pressure and blood glucose levels and the PCP visit frequency, preventative care frequency, and medical history we extracted records from patients at University of California, Davis BPSHI clinics, which are held within Sacramento County.

Based on our data, we were able to find that out of the sample size of 11 patients, 63.6% of patients had not gotten their prostate checked (Figure 1). Out of 90 patients, 57 have not visited their primary care provider in over a year. As a matter of fact, only 27 saw their primary

care provider within the last year and only 8 saw their primary care provider in the last month. (Figure 6)

Out of the sample size of 27, about 74.41 percent of women had stated that they have gotten a mammogram (Figure 2). Out of the sample size of 13, 46.2% of patients stated that they have gotten colorectal screenings (Figure 3).

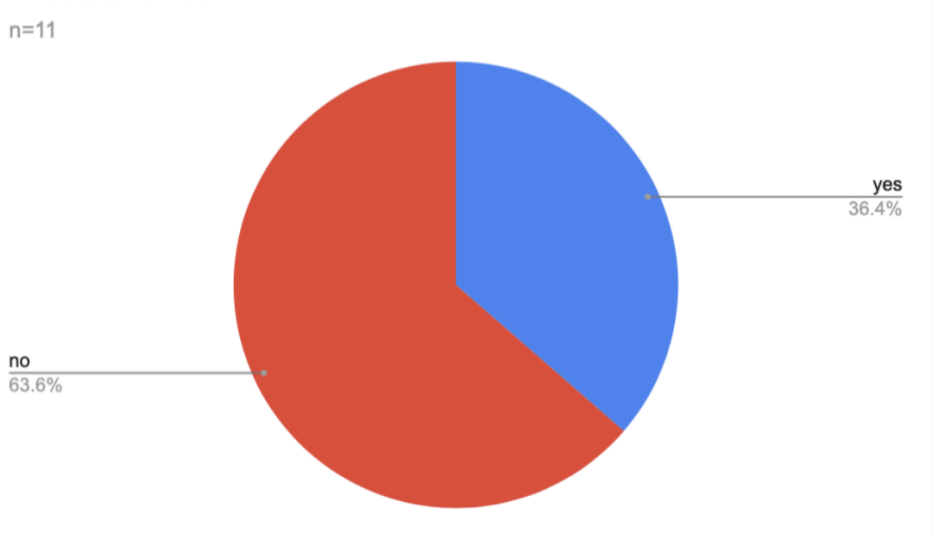
Within the population of patients that visited the BPSHI clinic, 45.8% had Hypertension (high blood pressure, 23.1% had Diabetes, and 17.5 % had Hyperlipidemia (high cholesterol). (Figure 7). These were three highest health conditions amongst the patient population.

With that being said, out of 389 patients, 52.4 % did have a blood pressure reading which was considered hypertensive. (Figure 10). However, out of 69 total people, 61 of them had normal blood glucose levels and were considered prediabetic (Figure 9). Out of the 17 that were screened who had been fasting that day, 9 of them had normal blood glucose readings while the other 8 had a reading which was considered prediabetic (Figure 8).

Out of all the people included in this study, which was 420, 59% of them were male, while the other 41% were women (Figure 4). Along with this, 78 patients were between the ages of 35-45 years old while 777 people were between the ages of 55-65 years old (Figure 5).

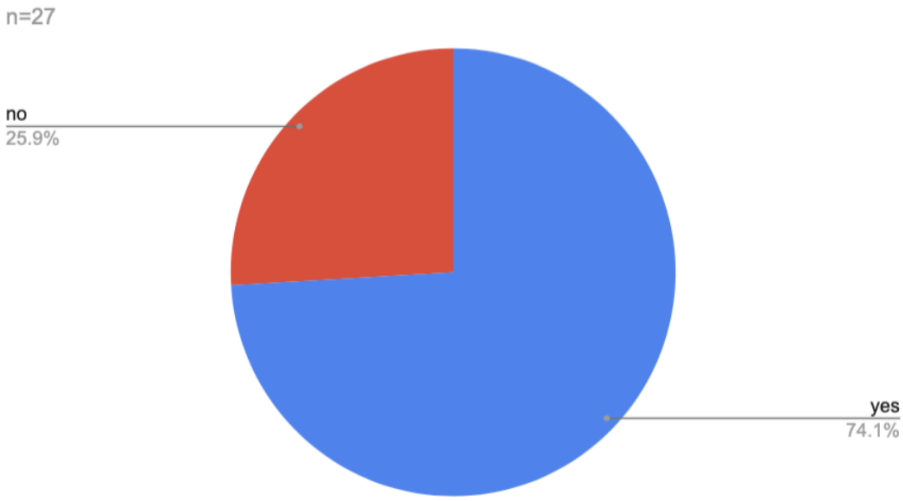
Figures

Figure 1: Regular Prostate Cancer Screening



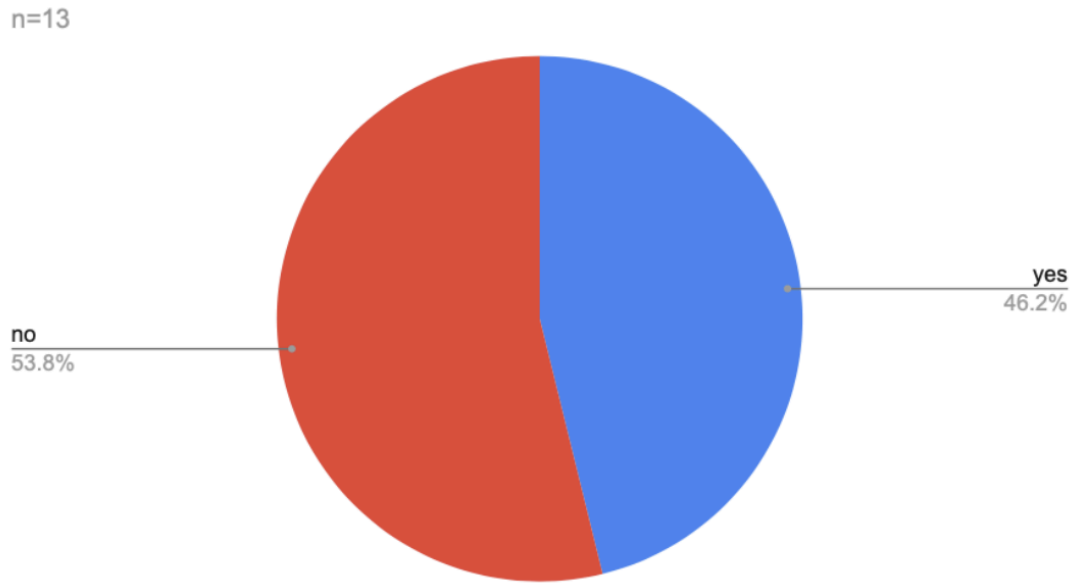
BPSHI patients typically do not receive prostate examinations, with 63.6% of patients having never gotten one before in the past. 36.4% of patients have had routine prostate exams performed within the last year.

Figure 2: Regular Mammogram Screening



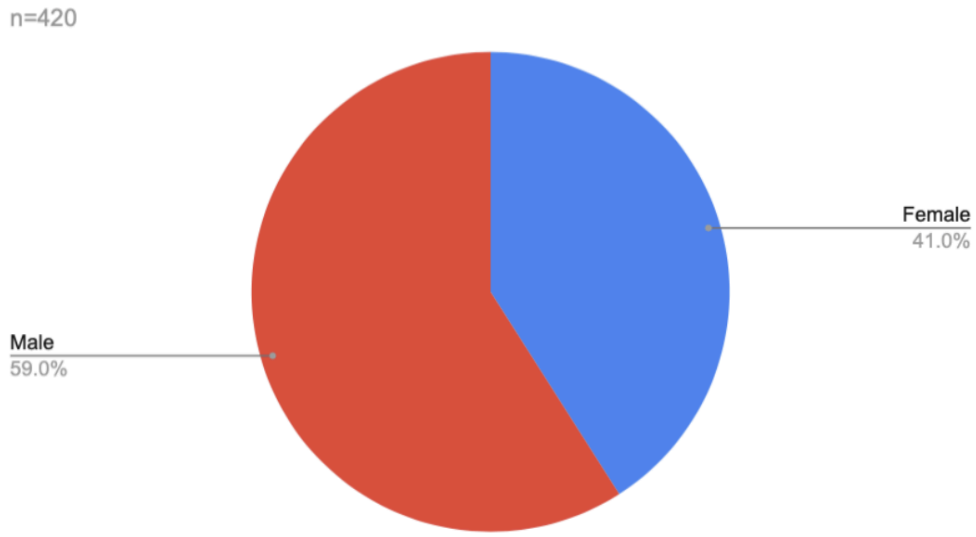
BPSHI Patients have a higher prevalence of having completed a routine mammogram exam, with 74.1% of women responding “yes.” 25.9% of patients have not completed a mammogram exam within the past year.

Figure 3: Regular Colorectal Cancer Screening



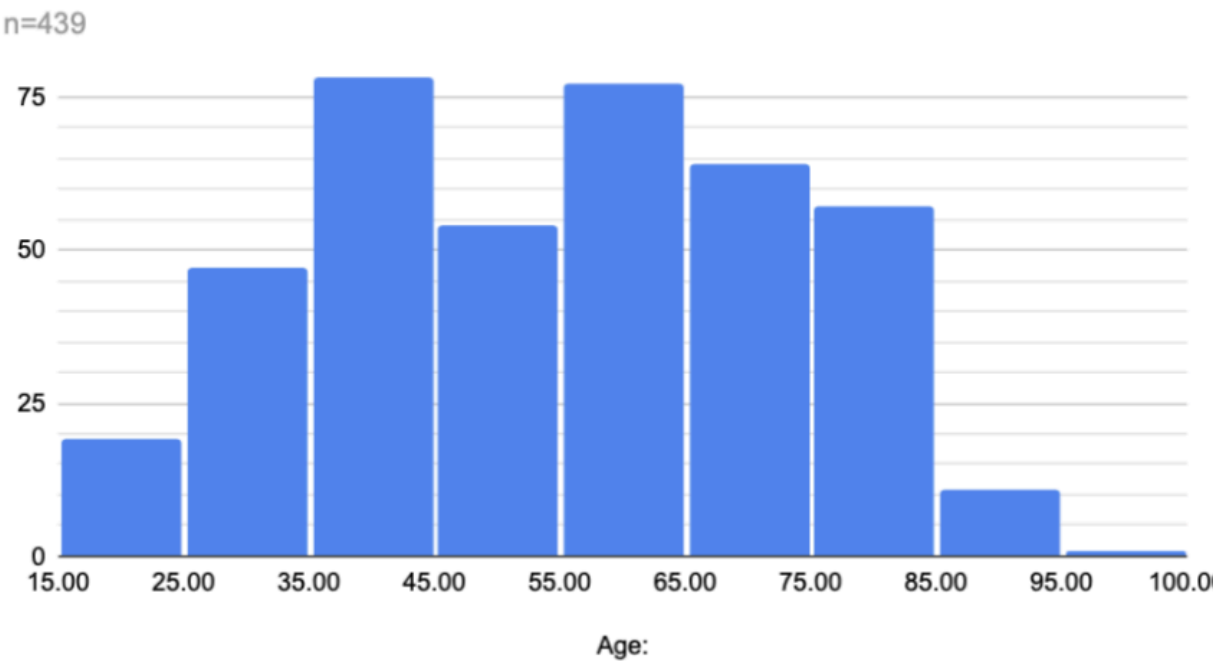
The majority of BPSHI patients have not received a routine colorectal exam (53.8%). 46.2% of patients have not had routine colorectal exams done before in the past.

Figure 4: Gender Distribution



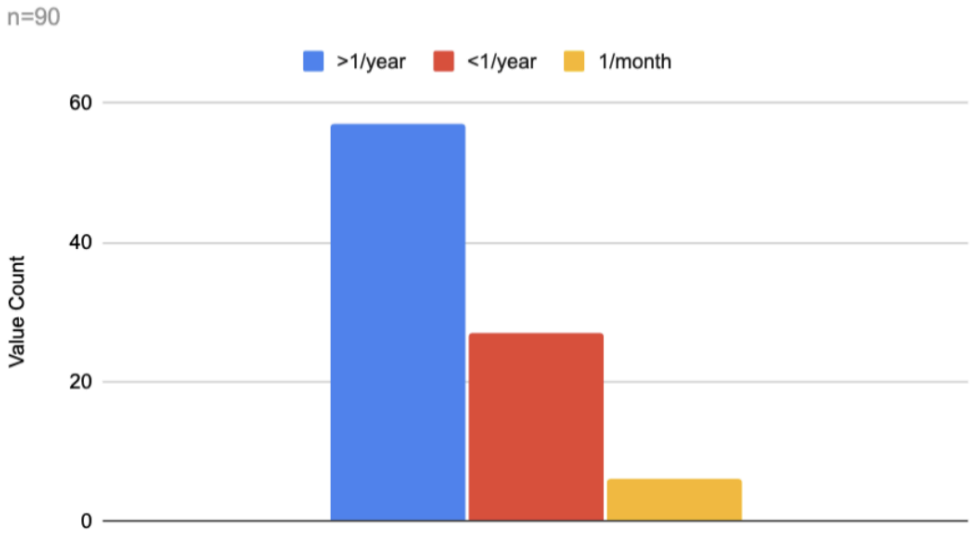
BPSHI's patient population consists of majority males, at 59%. 41% of patients are female.

Figure 5: Age Distribution



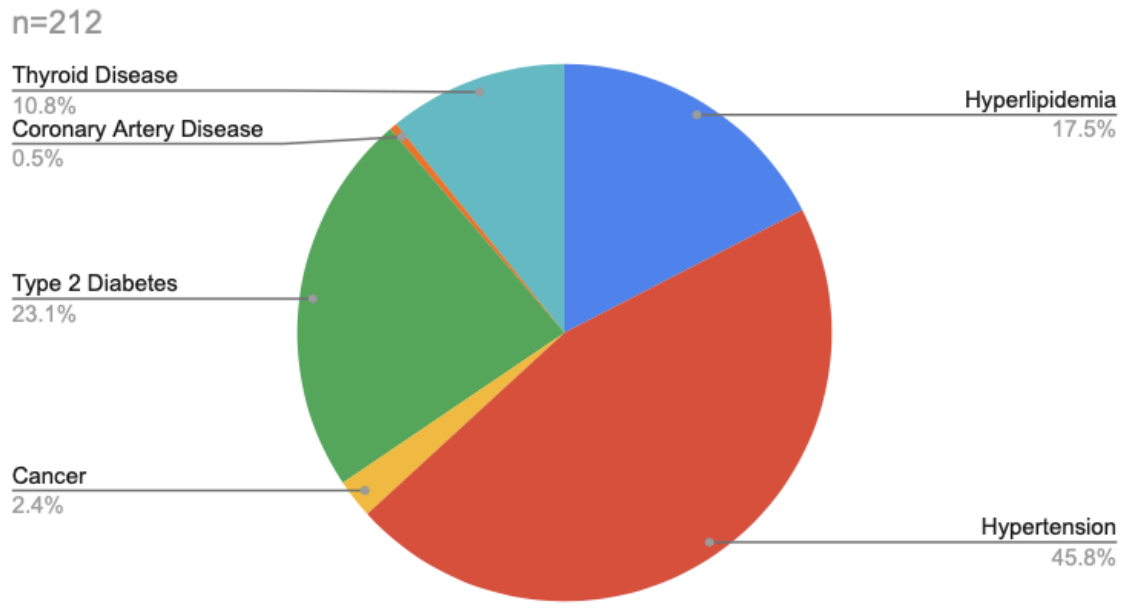
BPSHI's patient population ranges from 18 to 100, with the average age being 54.12.

Figure 6: PCP Visit Frequency



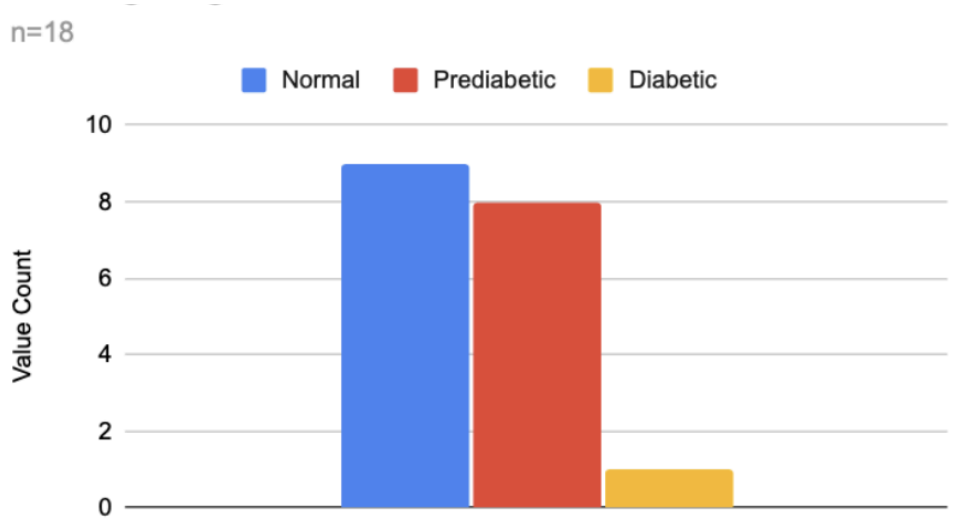
BPSHI patients most commonly see their PCP less than once a year. 63.3% of patients visit their PCP less than once a year, 30% visit their PCP more than once a year, and 6.67% of patients visit their PCP regularly once a month.

Figure 7: Chronic Health Conditions Distribution



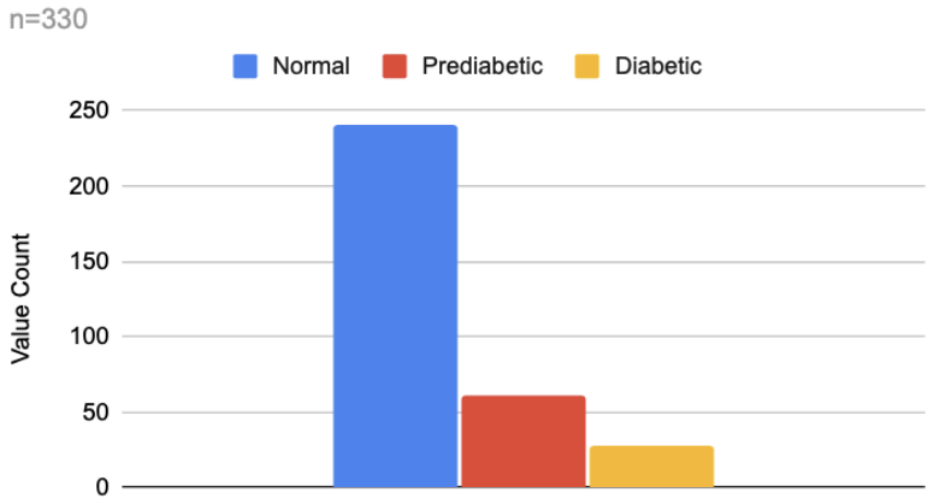
BPSHI patients most commonly had diagnoses of hypertension, at 45.8%. Type 2 diabetes and hyperlipidemia follow at 23.1% and 17.5%. 0.5% of patients had a diagnosis of coronary artery disease.

Figure 8: Fasting Blood Sugar Distribution



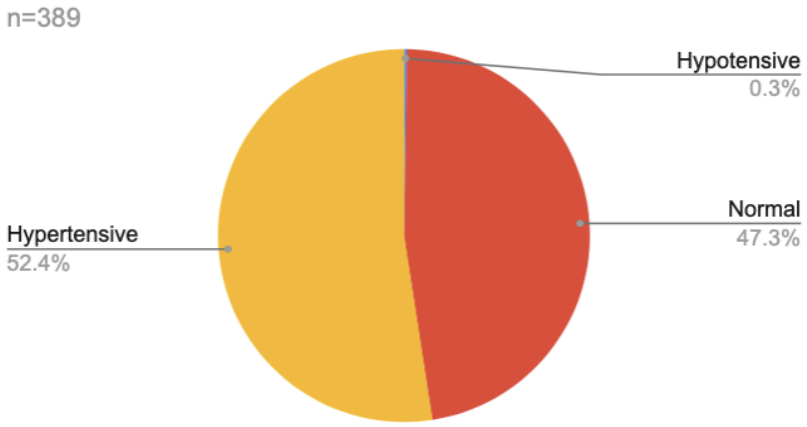
BPSHI patient’s blood glucose levels within patients who have been fasting. 50% of patients' values lied within the normal range, with 44% within the prediabetic range, and 5.56% in the diabetic range. These ranges are as follows: Normal: <100 , Prediabetic: >100, <125, and Diabetic: >125.

Figure 9: Non-Fasting Blood Sugar Distribution



BPSHI patient’s blood glucose levels within patients who have not been fasting. 73% of patients' values lied within the normal range, with 18.5% within the prediabetic range, and 8.5% in the diabetic range. These ranges are as follows: Normal: <140 , Prediabetic: >140, <200, and Diabetic: >200.

Figure 10: Blood Pressure MAP Count



BPSHI patient's mean arterial pressure (MAP) value counts display a majority of hypertensive patients. 47.3% of patients' values lied within the normal range, with 52.4% within the hypertensive range, and 0.3% in the hypotensive range. These ranges are as follows: Hypotensive: <65 , Normal: >65, <100, and Hypetensive: >100.

Discussion:

In terms of PCP visit frequency, most people visit their PCP less than once in a year, which is a stark number (Figure 6). This becomes especially concerning upon considering the average age of our population lies around 45-65 an age population that are recommended to receive regular preventative check ups (Figure 5).

This could also contribute to a lower amount of preventative care screenings, with 25.9% not performing a regular mammogram and 53.8% not receiving a regular colorectal exam, as they are not visiting their PCP to schedule these exams (Figure 2, Figure 3). An underlying problem can be linked to lack of accessibility, particularly for immigrants without insurance, who may not have access to a PCP. Furthermore, distrust in the medical system, and overall a lack of understanding are other suspected factors within these results. Within a Harvard paper,

marginalized communities are seen to be less likely to trust the medical system, further contributing to a low prevalence of PCP visits within our data (Harvard, 2023).

Upon investigation of blood glucose values, the majority of the participants are within the normal range, however 50% of the fasting category is prediabetic or diabetic, with 18% having prediabetic levels for non-fasting blood glucose levels (Figure 8, Figure 9). It is important to highlight that analysis for blood sugar may be skewed as many of the participants eat langar, or food, at the Gurdwara before checking. Non-fasting blood glucose values can range from 5 hours ago to right before a glucose check, causing a level of difficulty upon analyzing these specific results. Another key note is being that our data is collected at a religious temple, many patients' beliefs regarding their health are that prayer can solve their health conditions, without any changes to diet and exercise. There additionally may be a lack of general knowledge regarding diet, nutrition, a lack of available culturally sensitive education, and health overall. This is seen firsthand within our volunteers at clinics, as often patients do not come to the health education table where our resources are offered.

As seen within our blood pressure data,, 52.4% of patients tested within a hypertensive range, seen in Figure 10. When checking these vitals, the busy clinic environment could explain the higher levels, as the majority of the patients fell within this range. Specifically, patients would be walking around prior to getting their blood pressure checked, greeting friends and family, and talking with others at this time, all contributing to an increase in blood pressure. Furthermore, many patients would express concern prior to checking their values, which could also contribute to this increase through increased stress levels (Mayo Clinic, 2024). Together, these factors can cause patients to test within a hypertensive range regardless of a hypertension diagnosis, displaying a potential skewing of our results. As mentioned in a Mayo Clinic article,

taking deep breaths can help with relaxation, therefore leading to a decrease in blood pressure (Mayo Clinic, 2024). Since patients typically are not focusing prior to getting their blood pressure checked, Patients typically do not focus on maintaining a calm demeanor with blood pressure checks, displaying that higher values can be expected, and long-term data should be considered in a clinical setting prior to and diagnoses..

Along with this, one key factor that was not considered when creating Figure 10 was past patient history. This causes Figure 10 to consider patients who are already diagnosed with hypertension and those who are not together, which can affect the data as taking prescription medications, have a diagnosis of pre-hypertension, or possibly even having hypotension diagnosed may affect our data. One reason this consideration was not possible was due to patients often not updating their charts or providing fully accurate mediation details, as many do not remember the name of their medication, or dosage.

When considering the medical history of the patients, Figure 7 shows the most prevalent chronic health conditions. Specifically, 45.8% of individuals reported having hypertension (HTN), 23.1% have diabetes (DM2), and 17.5% have hyperlipidemia diagnoses (HLD). Upon analyzing all 3 of these conditions together, education of diet and exercise routines can be seen as common root causes for all of these conditions. Specifically, Punjabi food represents the diet consumed by the majority of the patient population, and includes the use of butter and ghee in most dishes, dairy in tea, and oil in fried foods. All together, these contribute to the consumption of saturated fats, and are typically accompanied by sweets, including large amounts of added and artificial sugar as well as saturated fats, which increase the risk of the prevalent health conditions detailed above. Diet can be seen as a large indicator for these chronic health conditions within

the patient population, however more data related to diet consumption can be considered to identify a stronger trend.

Along with this, exercise can help with controlling HTN, DM2, and HLD by strengthening the heart muscle, increasing insulin reception, and increasing removal of low-density lipoproteins from the body. When considering the patient population, consistent exercising can be seen as uncommon for many reasons, mainly occupation and age. Many patients who checked their vitals would do jobs that required sitting for long periods of time, such as truck driving or food delivery, affecting their ability to be active throughout the day. To better understand this relationship, more information on specific exercises performed may be collected, though a trend is viable when considering this information. Much of the patient population is above the age of 55, as seen in Figure 5, which can limit the kinds of exercising they may perform, leading to these prevalent chronic health conditions.

Furthermore, hypertension alone can also be considered when looking at chronic health conditions since it was the most prevalent. Beyond the factors already considered, patients would often be more likely to dismiss higher blood pressure values, indicative of hypertension, by dismissing their symptoms as an outlier to their baseline. A possible reason for this could be that a majority of individuals who test their blood pressure have hypertensive values, seen in Figure 10, but do not show any symptoms due to the nature of this disease, causing other individuals to be more dismissive to its severity (FDA, 2024). Considering this, since patients may not exhibit as much concern regarding their blood pressure as they might be with other vitals, they are more likely to continue their regular habits, or not realize they are at risk of HTN until they check their blood pressure at a much later time, since they may not have a machine at home.

Conclusion

This study analyzed the relationship between blood pressure, blood sugar levels with PCP visit frequency, preventive care utilization, and medical history among the Punjabi patient population in Sacramento County. Our findings demonstrate a higher rate of type 2 diabetes mellitus (DM2), hypertension (HTN), and hyperlipidemia (HLD) among the Punjabi population which are conditions that are closely related to dietary patterns, cultural practices, and primary care barriers. These findings demonstrate the importance of utilizing community resources to minimize the gap of health inequity the Punjabi population is facing.

Research done on the New York City Sikh community showed that culturally modified interventions where Punjabi language was incorporated in education, traditional dietary guidance, and community healthcare assistance led to an improvement in health outcomes within the population (Lim et al., 2019). The data collected within Sacramento County reflects this concept and displays where BPSHI can broaden its impact.

Many patients that BPSHI serves are unaware of the services available to them, including other free of cost UC Davis student run clinics, such as Imani and Elaaj. In the future, at the end of visits at the Gurdwara, BPSHI's volunteer scribes can actively communicate these resources to ensure that patients have the opportunity to receive annual healthcare visits. Additionally, BPSHI can work to host health education events or focus on outreach with current patients to help further reduce the healthcare gap within this community.

A significant outcome from this study includes the general trend of minimal regular screening exams done by patients. Screening exams have shown advantages not only for preventing disease, but also increasing recovery chances (Institute for Quality and Efficiency in Health Care [IQWiG], 2025). Moving towards the future, BPSHI can additionally focus on

educating patients on what demographic specific screening exams are important and beneficial for the patient's health outcome.

It is important to continue to remind patients with elevated vital values that medication can benefit their health outcomes. If health costs are of concern to the patient, BPSHI can focus on emphasizing available resources of various UC-Davis Student run clinics for free or reduced cost prescriptions. Accommodations, such as transport passes and clinical hours can be provided to patients to encourage their ability to obtain these resources.

Patient materials could also be redesigned as BPSHI already makes pamphlets, for some patients these can be very lengthy and not completely accessible for those who are busy. A concise one-page card that is available in both Punjabi and English with important health information, available services, and when to get care could serve the community and their needs.

It is beneficial that the health-education pamphlets have been updated to include the statistics found in this study. Many patients may be unaware of the health injustice that the Punjabi population faces, whether caused by genetic, lifestyle, socioeconomic reasons, etc. Presenting these statistics, in an evidence based manner, can provide patients with personalized insights of their own health. The health education team can emphasize the importance of healthy lifestyle factors in their pamphlets as suggested by organizations like the American Heart Association.

Although this study is in regards to the Punjabi patient population in Sacramento County, its results can apply to the more general population. Intervention studies that focus on lifestyle relating to the risk of type 2 diabetes, hypertension, and hyperlipidemia are extremely needed. Many groups of people around the United States share similar chronic diseases due to diet and cultural beliefs where health models could be very valuable. As BPSHI continues to refine these

methods, the work done serves as a replicable model to deal with the disparities in underserved and immigrant populations beyond just Sacramento County.

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