

VILD Foundation

Diabetes Screening Camp Summary

Location: Bherya, Mysore, Karnataka

Date: June 29, 2019

I. Introduction

Diabetes is known to be a serious non-communicable and chronic disease that can lead to many serious complications and other health problems which can severely affect various parts of the body. In 2017, the population of diabetic patients in India was estimated to be close to 73 million (IDF 2017) – hosting the second largest population of diabetes cases globally (Wangnoo 2013). The state of Karnataka is also estimated to have the 5th highest prevalence rate of diabetes.

With the rapid changes in lifestyle, diet and environment, the population of diabetic patients in India is only projected to rise higher and faster as time passes. Indians have also been speculated to be more prone to diabetes – developing it at a faster rate and at a younger age (Gujral 2013). More alarmingly, it was estimated that almost half of diabetic patients are not aware that they have the disease as the symptoms of diabetes varies and may not always be present (Abbott 20

However, early detection and good management of type II diabetes, which is the most common form of diabetes in India, can prevent many health complications. Yet given a large population and limited resources in blood glucose tests, screening of diabetes continues to be a great challenge for public health.

Thus, scientists have come up with the Indian Diabetes Risk Score as a screening tool to pick out only those at high risk of diabetes to go for blood glucose test. As such, this project and camp by VILD Foundation and SVYM aims to use this tool to assess its effectiveness in screening the population for diabetes. This report, in particular, also aims to look at other possible indicators that could serve as diabetes pre-screening tool.

II. Camp Statistics:

The procedure for the camp is as followed:

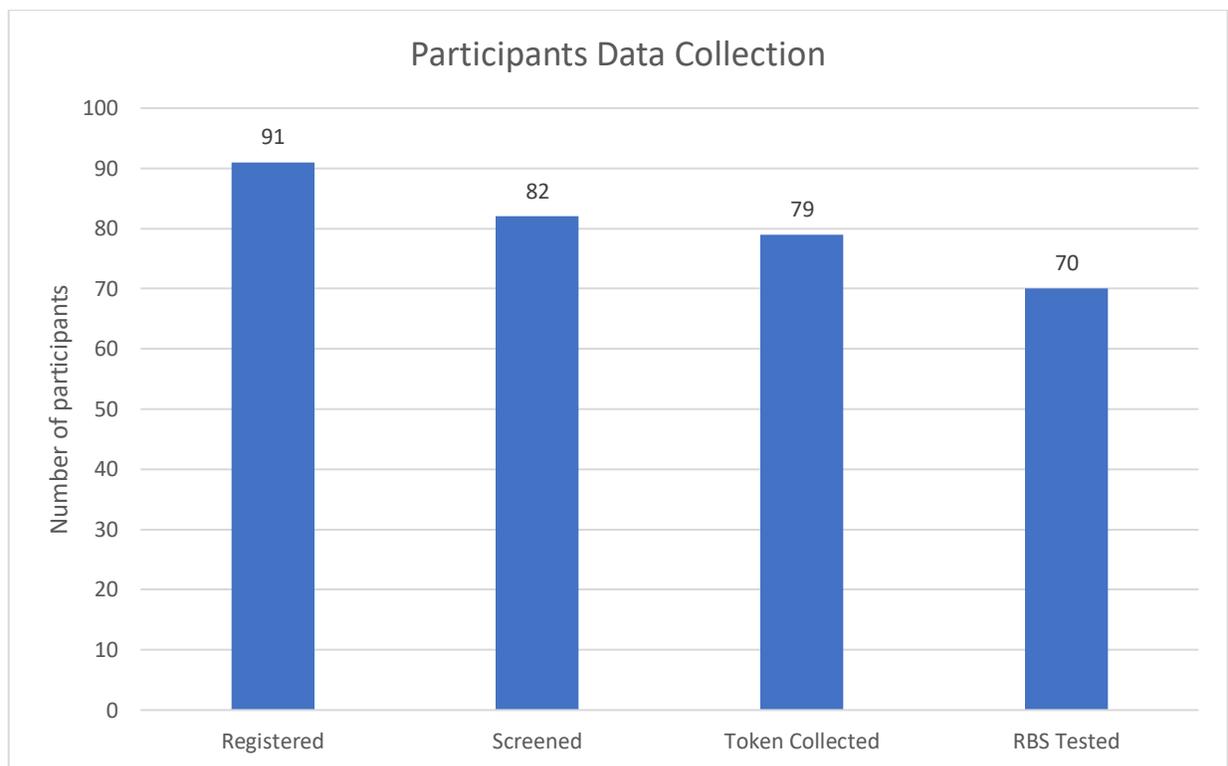


Figure 1. Number of Participants in the Camp

Among 91 participants who were present and registered, there were 9 did not participate in the diabetes screening. Among those who were screened, 79 tokens with measured blood pressure and RBS data were collected. RBS levels were recorded for 70 participants who were categorized as Moderate or High Risk during the screening using the IDRS.

III. Definitions Used

- **Type II Diabetes Mellitus (DM):** If their Random Blood Sugar level was above 200mg/dl OR they have been known to have DM.
- **Hypertension:** If their blood pressure reading was at least 140/90 for either systolic or diastolic reading.
- **Weight Status** (as modified for South Asians – WHO 2004):

	Underweight	Healthy	Overweight	Obese
Body Mass Index (BMI)	<18.5	18.5 - 23	23.1 -27.5	≥ 27.5

- **Risk for Diabetes using the Simplified Indian Diabetes Risk Score (IDRS):**

The Indian Diabetes Risk Score (IDRS)		Score
Age		
< 35 years		0
35 – 49 years		20
≥ 50 years		30
Family Members with Diabetes		
0 member		0
1 member		10
2 members		20
Waist Circumference		
Women	Men	
< 80cm	< 90 cm	0
80 – 89 cm	90 – 99 cm	10
≥ 90 cm	≥ 100 cm	20
Physical Activities		
Vigorous (Strenuous physical jobs or housework)		0
Moderate (Moderately strenuous physical job or housework)		10
Mild (Minimal physical activities, short walks)		20
None (Almost no strenuous physical activities)		30

Total IDRS Score	0 - 20	30 - 50	60 - 80
Risk	Low	Moderate	High

IV. Tabulated results and Analysis

a. The Indian Diabetes Risk Score:

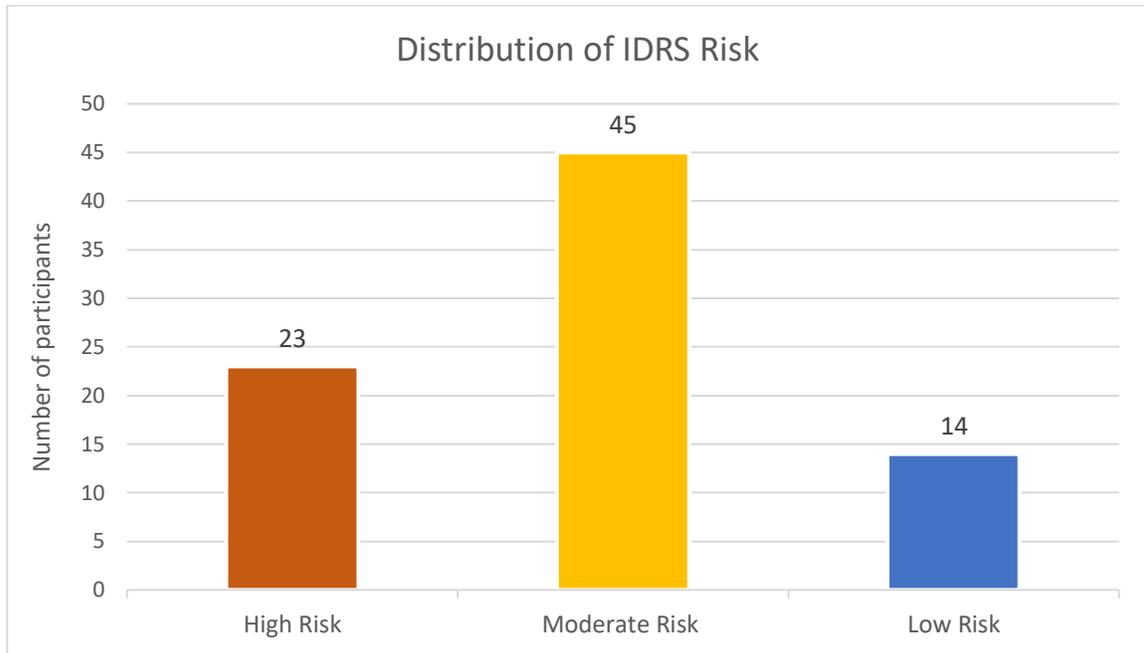


Figure 2. Distribution of Risk among participants using IDRS

More than half of the participants were categorised as having a moderate risk of having type II diabetes. All of the participants were screened for blood pressure, but only those with moderate and high risks were tested for diabetes using the random sugar blood test.

Table 1. Factors with Highest Risk Score against Overall IDRS

Risk	Age \geq 50	At least one family member with known DM	Large waist circumference	Minimal physical activities
High	13	7	11	15
Moderate	15	8	12	8
Low	0	2	0	0
Total	28	17	23	23
Rank	1	4	2	2

This table shows the distribution of participants with the highest score for each factor against the overall risk that they were categorized in. The factors with the highest risk score include people older than 50 years old, those with a family history of diabetes, large waist circumference (at least 90cm for women and 100cm for men) and those with sedentary lifestyle. From this table, we can deduce the most prominent factors that affect the IDRS among participants. The highest number of participants categorised as having a high risk of DM are those with minimal physical in this population.

The two modifiable factors of large waist circumference and inactive lifestyle both seem to have major contribution to the final risk score. Thus, this shows that by encouraging a change in diet and physical activities in participants, we can intervene to reduce the risk of contracting these diseases in the population.

Table 2. Association of factor characteristics with IDRS scores

		Moderate – High Risk	Low Risk	Odds Ratio (p-value)	Chi-square (p-value)
Gender	Male	32	4	2.22	1.61
	Female	36	10	(0.20)	(0.20)
Family History	Present	15	2	1.70	0.43
	Absent	53	12	(0.51)	(0.51)
Waist Circumference	Large	23	0	14.97	NA
	Normal	45	14	(0.064)	(NA)
Physical Activity	None – Mild	33	4	2.36	1.86
	Moderate – Vigorous	35	10	(0.18)	(0.17)
BMI	> 23	23	9	0.28	4.53
	≤ 23	45	5	(0.040)	(0.033)

From this table, the odds of having a large waist circumference were almost 15 times greater among those with moderate and high risk than those with low risk. Meanwhile, the odds of being a male, having a family member with diabetes and engaging in little physical activities were all roughly twice among those with moderate and high risk compared to those with low risk.

However, the p-values for all 4 factors were greater than 0.05 and are not statistically significant. However, since data in some categories are smaller than 5, the Central Limit Theorem may not apply and the p-value may not be valid.

Interestingly, looking at BMI, it seems that the odds of having a higher than normal BMI were smaller among those categorized as having a high - moderate risk than among those with low risk. The chi-square also shows a statistically significant association between BMI and high risk in IDRS.

b. Disease Prevalence:

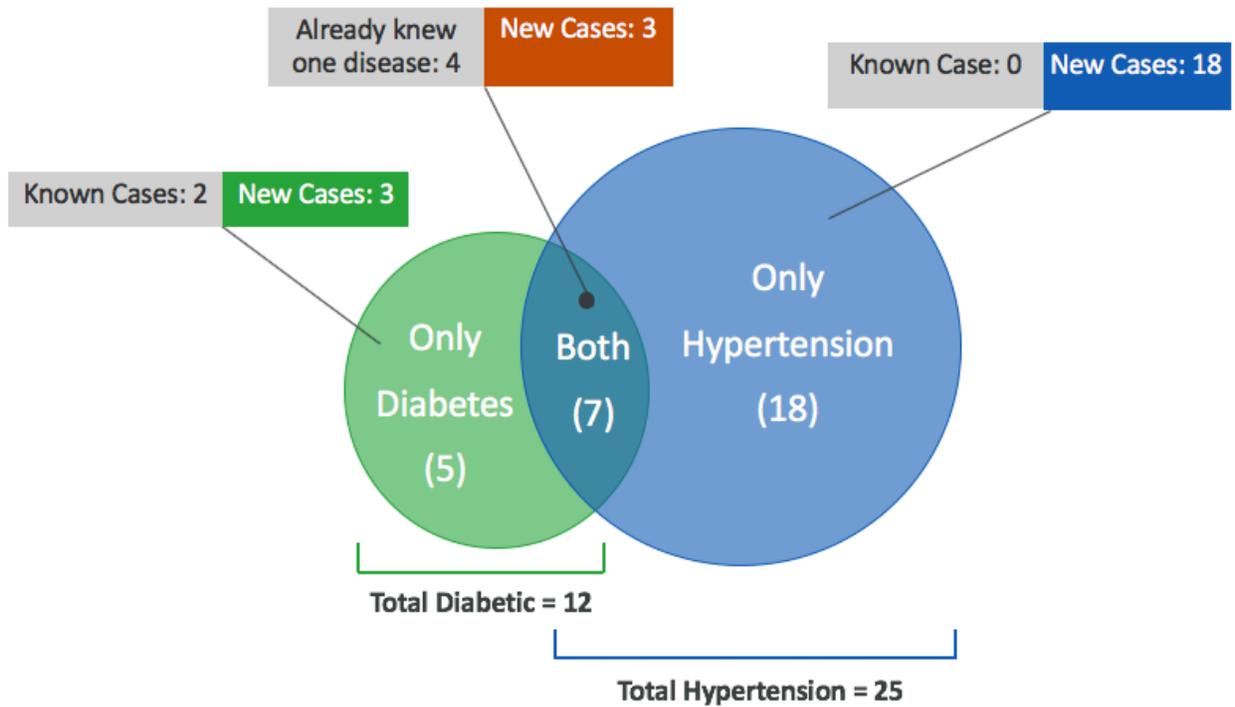


Figure 3. Disease Prevalence among Participants

A total of 23 participants had either type II diabetes or hypertension and 7 participants had both diabetes and hypertension.

It was previously speculated that the population suffers from a high prevalence of type II diabetes. However, the screening revealed that the prevalence of hypertension (25 cases) is double of diabetes (12 cases), hence presenting a more pressing concern.

The high number of new cases detected also signals the need for a screening program for early detection and intervention of chronic diseases. With early detection and intervention, both conditions can be managed more easily and further complications can be prevented in time.

Table 3. Disease Prevalence against IDRS

Risk		Only DM	Only HTN	Both	Total
High	70-80	1	2	2	5
	60	2	0	2	4
Total		3	2	4	9 (30%)
Moderate	50	2	5	2	9
	40	0	6	1	7
	30	0	5	0	5
Total		2	16	3	21 (70%)
Low	0-20	0	0	0	0

This table summarises the distribution of risk scores among patients with disease in the population. The IDRS shows to be fairly effective in detecting those with DM, as 7 out of 15 patients (46.7%) with diabetes were categorised as high risk. The majority of cases of hypertension (76%) were categorised as having a moderate risk using IDRS.

It appears that most patients with diabetes (and those with both diabetes and hypertension) have a score of 50 and above. Since IDRS was not designed to detect hypertension, it is evident that there is less of a relationship between the IDRS score and hypertension: the number of patients with disease seems to be evenly distributed across the score range from 30 – 80.

c. Gender

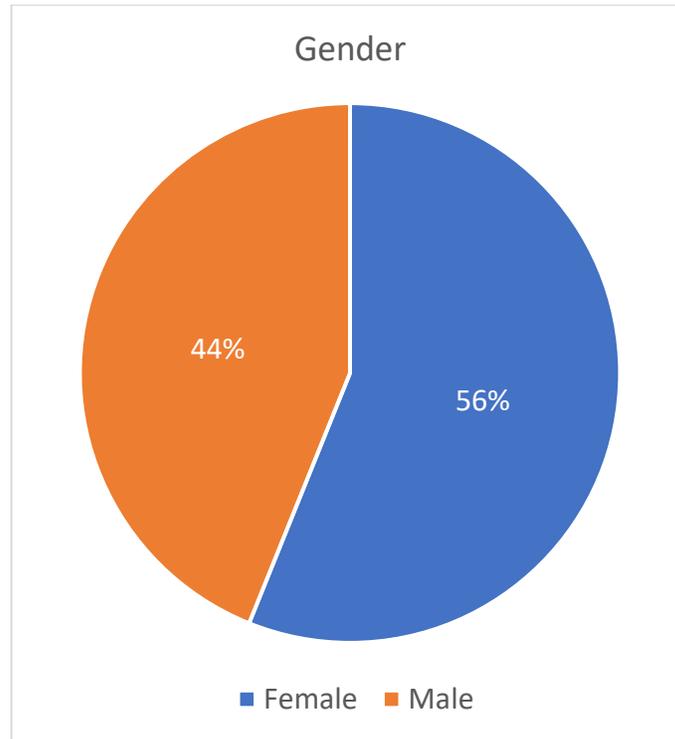


Figure 2. Gender of Participants

Table 4. Gender against IDRS and Disease Prevalence

	High Risk	Moderate Risk	Low Risk	Total	Only DM	Only HTN	Both diseases	Total (% of total gender)
Male	10	22	4	36	2	10	2	14 (38.9%)
Female	13	23	10	46	3	8	5	16 (34.8%)

Since the initial target population of the camp was the self-help groups, the majority of the participants were female. There were more females categorised as having a low risk compared to males. However, almost 39% of the male participants had either or both diseases, slightly higher than at 35% for female participants.

d. Age Group

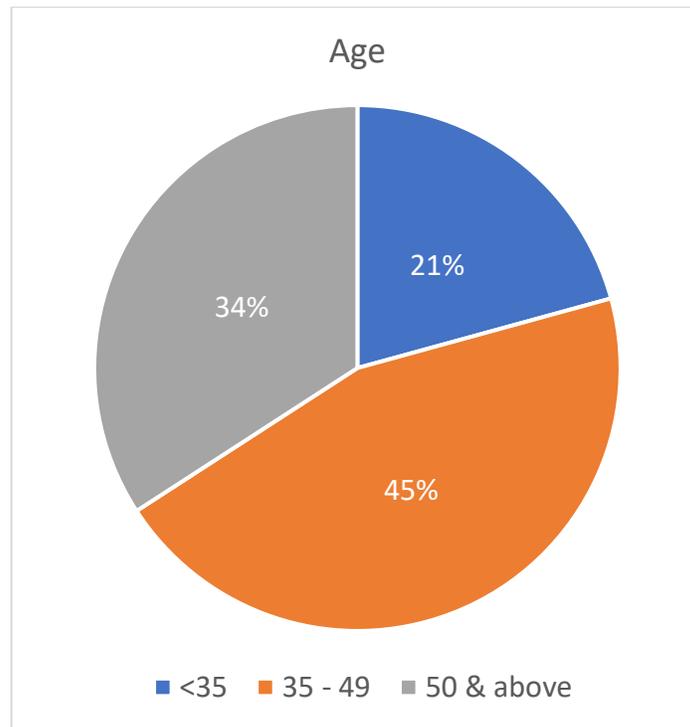


Figure 3. Age Groups among Participants

Table 5. Age Groups against IDRS and Disease Prevalence

	High Risk	Moderate Risk	Low Risk	Total	Only DM	Only HTN	Both diseases	Total
< 35	0	8	9	17	0	1	0	1 (1.22%)
35-49	10	22	5	27	1	9	4	14 (46.7%)
≥ 50	13	15	0	28	4	8	3	15 (50.0%)
Total	23	45	14	82	5	18	7	30

The average age for this population is 45.6 years. The majority of them are in the middle-aged group (35-49 years), where most of them (81.5%) were categorised as having a moderate risk of diabetes.

When analysing the profile of those with diseases, half of the them were of higher age group (50 years and above). Only 1 participant under 35 years old had hypertension and none was categorized as having a high risk of diabetes.

Among those with diabetes, 41.6% were in the middle age group (35 – 49 years old), which is alarming as it indicates that the diabetes is affecting more younger people in this population. As such, there should be measures put in place to educate to prevent and detect the disease early for people with moderate to high risk.

e. Profession

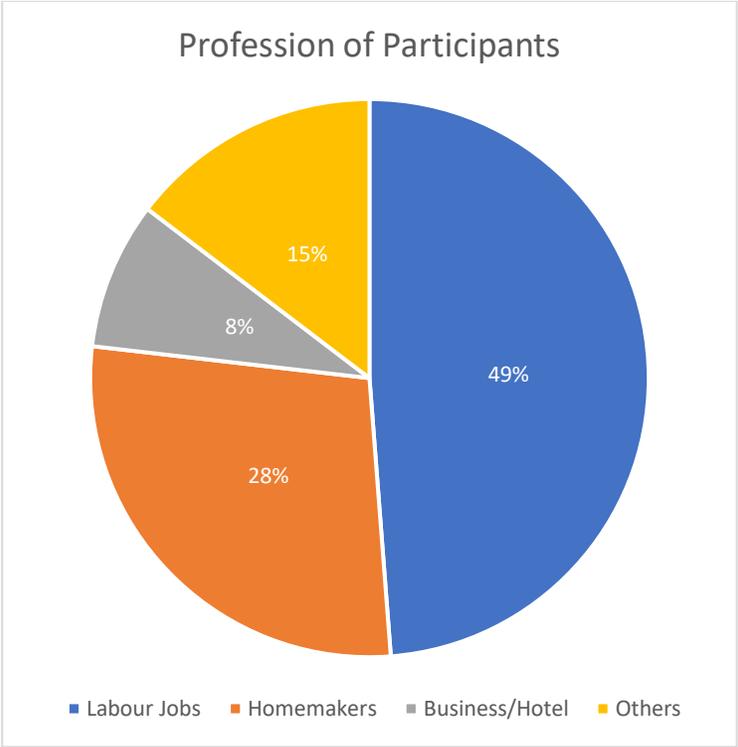


Figure 4. Profession of Participants

Note: Some participants have two jobs. However, in this report, only the main job will be considered.

Labour jobs included: Agriculture, field work, mason, construction worker and labour job in general. Other jobs include car painter, civil engineer, driver (3), mechanics, musician, office worker, student, tailor (2) and water supply.

The majority of participants (40%) have labour jobs which require vigorous physical activities as they have to work on the field outdoors. Some homemakers also engage in moderate to vigorous physical activities as they hand wash clothes and walk long distances to fetch water.

Table 6. Profession against IDRS and Disease Prevalence

	High Risk	Moderate Risk	Low Risk	Total	Only DM	Only HTN	Both	Total (% of total diseased)
Labour jobs	5	28	7	40 (48.8%)	2	11 (36.7%)	2	15 (50%)
Homemakers	11	9	3	23 (28%)	3	1	5	9 (30%)
Business /Hotel	2	2	3	7 (8.6%)	0	1	0	1 (3.3%)
Others	5	6	1	12 (14.6%)	0	5	0	5 (16.7%)

Table 7 shows the distribution of professions against the overall risk and disease prevalence among participants. Interestingly, half of the participants suffering from one or both conditions have labour jobs (15 out of 40 participants with labour jobs have one or both diseases). This was unexpected since most participants reported to engage in vigorous field work or physical work. However, this population with labour jobs might also hav

Looking at IDRS, homemakers have the highest percentage of high and moderate risk, most possibly due to their lower level of physical activities. Within this population, 67% had diabetes (8 out of 12). Those in the business/hotel sector with low level of physical activities have low prevalence of disease, possibly because of their much lower average age of 36.

f. Physical Activities Level

Table 7. Level of Physical Activities against IDRS and Disease Prevalence

Physical Activities Level	High Risk	Moderate Risk	Low Risk	Total	Only DM	Only HTN	Both	Total (% of total diseased)
Vigorous	0	20	6	26 (31.7%)	0	7	1	8 (26.7%)
Moderate	3	11	4	18 (22.0%)	2	5	2	9 (30.0%)
Mild	5	6	4	15 (18.3%)	2	1	1	4 (13.3%)
None	15	8	0	23 (28.0%)	1	5	3	9 (30.0%)

Corresponding to 40% of the population having labour jobs, 31.7% of the participants were categorised as engaging in vigorous physical activities and most of them fall into the moderate risk group. However, the most of the participants with disease were belong to the group with moderate and that with no physical activities.

Physical Activities	DM	No DM	Odds Ratio (p-value)	95% CI (Z-statistics)
Mild - None	7	31	1.76	0.51 – 6.09
Vigorous - Moderate	5	39	(0.37)	(0.89)

Studying physical activities as an indicator for diabetes, it was show that the odds of engaging in mild to no physical activities were 1.76 times greater among those with DM than those without. However, this ratio is not statistically significant. Thus, the lack of physical activities cannot be considered a risk factor according to this set of data.

g. Body Mass Index

Table 8. BMI against IDRS and Disease Prevalence

	High Risk	Moderate Risk	Low Risk	Total	Only DM	Only HTN	Both diseases	Total (% of total disease)
Obese	8	8	0	16 (19.5%)	0	5	3	8 (26.7%)
Overweight	11	18	5	34 (41.5%)	4	9	2	15 (50%)
Healthy	4	13	8	25 (30.5%)	1	4	2	7 (23.3%)
Underweight	0	6	1	7 (8.5%)	0	0	0	0 (0%)

Average BMI: 24.0 (Overweight)

It was observed that 61% of the population screened were obese or overweight. 50% of participants with disease are overweight and almost 27% are obese. The overweight group has the greatest number of participants with hypertension (36%).

BMI	HTN	No HTN	Total	Odds Ratio (p-value)	Chi-square (p-value)
>23	19	31	50	2.66	3.41
≤ 23	6	26	32	(0.070)	(0.065)
Total	25	57	82		

Running further tests to investigate any relationship between BMI and hypertension found no statistically significant values and hence, it is inconclusive to deduce a relationship based on this set of data.

h. Waist Circumference

Table 9. Waist Circumference against IDRS and Disease Prevalence

Waist Circumference	Male	Female	Total	Only DM	Only HTN	Both diseases	Total (% of group)
Normal	18	14	32 (39%)	1	5	0	6 (18.8% of 32)
Moderate	10	17	27 (33%)	2	7	3	16 (59.3% of 27)
High	8	15	23 (28%)	2	6	4	12 (52.2% of 23)

More than half of the participants have a larger waist circumference than normal. Almost 94% (28 out of 30) of those with one or both diseases have a larger waist circumference than normal. Among the group with moderate and the group with high waist circumference, more than half of each group ended up having at least one disease, which is very alarming. More females than males have larger waist circumference than normal.

Since only one person with normal waist circumference had diabetes, the sample size is too small to run a chi-square test to further investigate whether waist circumference is associated with diabetes.

i. Comparison between IDRS and BMI as screening tools for detecting DM

Total sample size = 68 (high and moderate risk – screened for Diabetes)

IDRS	DM	No DM	Odds Ratio (p-value)	Chi-square (p-value)
High Risk	7	16	3.50	3.91
Moderate Risk	5	40	(0.056)	(0.047)

BMI	DM	No DM	Odds Ratio (p-value)	Chi-square (p-value)
> 23	9	36	2.83	2.98
≤ 23	3	34	(0.14)	(0.13)

From these two tables, based on odds ratio, it is inconclusive whether IDRS or BMI would be a better screening tool. Even though IDRS seems to have a higher odds ratio with diabetes compared to that of BMI, both ratios are statistically insignificant. However, looking at the chi-square values, IDRS appears to be a better screening tool as there is a statistically significant relationship between IDRS and diabetes.

Other Strengths and Weaknesses:

	IDRS	BMI
Strengths	<ul style="list-style-type: none"> • Comprehensive (factoring in many risk factors for diabetes) • Relatively widely studied screening tool • Only require simple tools to measure waist circumference 	<ul style="list-style-type: none"> • Objective, quick and easy measurement and calculation • Potential indicator for risk of other diseases
Weaknesses	<ul style="list-style-type: none"> • Hard to assess and categorise level of physical activities • Fairly complicated calculations • Subjective, depends on honesty of participants 	<ul style="list-style-type: none"> • Uncertain association with diabetes • Require tools to measure height and weight

V. Assessing the camp and the diabetes screening process using IDRS:

a. Strengths:

- *Quick and Non-invasive:* The screening was fast (with an average time needed of 2 minutes)
- *Informative:* Many useful anthropometric information (height, weight, waist and hip circumference) was collected that could be used for further analysis.
- *High rate of participation:* The camp was aimed at self-help groups but there were a lot of participants who were from the general public that were present. This means that there was good information being spread about the camp.

b. Weaknesses:

1. Difficulty in taking measurements:

- *Heights:*

Height measurements were taken using the known marking on the wall and a ruler. However, due to the baseboard at the bottom of the wall, it was hard to obtain an accurate measurement. The only way was for the person to stand straight with their heels touching the wall and their heads not touching the wall. In reality, this was still very difficult because most elderly patients were still unsure of how to stand straight with instructions. Some patients were shorter than the lowest height marking on the wall and estimates needed to be made. Measurement were rounded down to the nearest cm.

- *Hip and waist measurement:*

Most women visiting the camp wore sari, which makes it difficult to obtain an accurate reading of waist and hip measurement.

- *Family History:*

A lot of people answered that they do not have family members with diabetes. However, this might be due to the lack of screening and understanding of the disease among the population and their family members also do not know of their diabetes history and status.

2. Difficult in estimating level of physical activities:

It is always very difficult to define and assess a person's level of physical activity, especially given a constrain in time. For the camp, the questionnaire was designed to mainly evaluate the participants' level of physical activities based on their main occupation. This is because most Indians in the rural areas do not engage in additional exercises and mainly engage in physical work for their living (such as doing agriculture field work). Participants were also asked about their walking habits as many have to walk long distances to get to their workplace or to perform housework duties such as fetching water. Homemakers were also asked to name some of their housework duties because to factor in the fact that many also engage in vigorous work like washing clothes by hand.

However, despite these modifications, it was still very hard to immediately categorising participants as having none, mild, moderate or vigorous activities.

Despite this, this component of the IDRS is tricky to improve as the aim of IDRS is to be a quick pre-screening tool for diabetes. It is not meant to confirm whether the person is diabetic but only to decide whether further testing or counselling to prevent the disease is necessary. Thus, a more elaborated questionnaire to accurately assess the person's level of physical activities defeats the purpose of being a quick tool and is not completely necessary as well.

3. Sample size is too small:

With limited time and the aim to instantly return the result to those with diabetes, it is impossible to screen too many participants and collect enough data to generate valid data where statistical tests could be used.

4. Inconsistent and Dishonest Answers:

- *Age:*

Participants may not have been honest about their age. There were 22 participants (26.8%) with inconsistent records of their age between the registration and the interview assessing diabetes risk. Most of them were females (59%) and “aged-up” when answering for interview questions for diabetes.

Possible reasons:

- People who “Age down”: They want to appear younger (most people who did not give the correct age were females) – link with the desire to be younger/more beautiful?
- People who “age up”: since the camp is trying to screen for diseases, they want to be screened for all of their problems.

Suggestion: Include additional question on the age of their first-born child to gauge or affirm if their reported age is correct.

- *Alcohol and Tobacco Consumption:*

Participants might have been embarrassed of their unhealthy habits and it was hard to determine whether they were honest about their alcohol and tobacco consumption.

5. Possible confusion in organisation of the camp :

There were 9 participants who did not participate in the diabetes screening and subsequent health check-ups. This could have been due to confusion in the way the camp was organized and the participants did not know where to go and what exactly the activities were. However, considering the large number of participants, the camp was very smoothly run and participants were very calm and ordered.

Suggestion: Clearer communication and directions regarding the different areas of activities could help to improve this.

VI. Conclusion

It is observed that both diabetes and hypertension are prevalent health problems in this population and require attention for early detection and timely management of disease to prevent further complications. The success and high participation rate of the screening camp proves that this model might work and can attract a large number of people to come to be check-up, considering that people might be more reluctant to visit healthcare centers just for a check-up in the absence of such program.

Regarding using the Indian Diabetes Risk Score for pre-screening of diabetes risk, it has been observed that it is fairly effective in sieving out those with moderate and high risk for confirmation blood glucose tests. There were a few restrictions that hinder the screening from being accurate as mentioned. However, in order to keep the screening short such that more people could be screened, the current model is considered to be good in practice.

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