Abstract

Context: Adult population visiting COVID vaccination center is a potential teachable moment for screening and preventive advice on non-communicable diseases. Objectives: The objective of this study was to assess the proportion of vaccinees volunteering for screening and to know the proportion of newly detected hypertensives and diabetics among the screened vaccinees at COVID-19 vaccination center. Setting and Design: This descriptive, cross-sectional, operational research study was carried out at the COVID vaccination center at a medical college in central Gujarat from July to September 2021. Methods: After receiving the vaccine, the vaccinee was offered screening through a community-based assessment checklist for risk factors of non-communicable diseases, blood pressure, and blood sugar measurement. Those volunteering for this screening received a slip mentioning their risk score, blood pressure and blood sugar reading, and relevant health information and disease prevention advice. The study variables were acceptability (proportion of vaccinees volunteering for screening) and yield (newly detected hypertensives and diabetics among those screened). Results: Among vaccinees, 27.7% volunteered for risk scoring and blood pressure measurement, whereas 8.3% volunteered for blood sugar measurement. Around 15.5% of vaccinees had high-risk scores as per the community-based assessment checklist. The yield of freshly detected high blood pressure and high blood sugar was 19.3% and 10.5%, respectively. The yield was similar even among vaccinees under 30 years of age. Conclusions: Vaccinees demonstrated interest in undergoing screening for non-communicable diseases. Yield indicates that such screening is worth the effort.

Keywords: COVID vaccination center, diabetes mellitus, hypertension, non-communicable diseases, risk scoring, screening, teachable moment

Introduction

Vaccination is a major prevention tool in the COVID-19 pandemic response. COVID-19 vaccination in India started from January 2021 with the health care and frontline workers being eligible in the first phase. The second round included the citizens aged above 60 years and those above 45 years with selected comorbidities. Now all adults 18 years and above are eligible for the vaccination available from the government and private health facilities.

This vaccination center visit marks the health facility contact of apparently healthy adults. This contact of adult citizens can be utilized as a teachable moment. The individual adults who volunteer to come to the vaccination center are likely to be more receptive to health advice. Thus, there is an opportunity to offer a health check-up and preventive advice to such a receptive population. This can work at two levels of prevention. At the primary prevention level, all vaccinees can be offered a risk scoring questionnaire. Those at high risk can be provided preventive advice. At the secondary prevention level, all adults can be offered health check-ups for detection of non-communicable diseases (NCDs). This is relevant in the backdrop of an alarming rate of undetected non-communicable diseases among adults in India reported by the recent National Non-Communicable Disease Monitoring Survey (NNMS). Though such screening seems feasible with limited resources, there is no published literature on such screening from India.
In this operational research study, we intended to assess the proportion of vaccinees volunteering for screening and to know the proportion of newly detected hypertensives and diabetics among screened vaccinees at the COVID-19 vaccination center at a medical college hospital in Vadodara, Gujarat.

**Methodology**

This was a descriptive, cross-sectional, operational research study conducted at a COVID vaccination center (CVC) located at a medical college in central Gujarat. The study reports the screening experience from 22 July 2021 to 30 Sept 2021. All vaccinees, 18 years and above, receiving the vaccine during the study period at this site were eligible to participate in the study.

The study instrument had three parts. Part 1 consisted of demographic details of the consenting vaccinees participating in the study. Part 2 was a risk-scoring questionnaire for non-communicable diseases. The community-based assessment checklist (CBAC) of the Government of India was used for this purpose. We used Part A of the checklist for this study. This checklist contained grading the person’s risk based on age, history of tobacco and alcohol use, waist circumference, physical activity, and family history of non-communicable disease. For part A of the checklist, a score above 4 out of 10 was considered at risk for NCDs and counselled accordingly.

Part 3 was a selective physical examination. Blood pressure measurement was done using an aneroid sphygmomanometer (Diamond, Industrial Electronic and Allied Products). The blood pressure was measured with the patient in sitting position with feet flat on the floor and arm resting on the table. Clothing was removed before placing the cuff on arm. The reading was taken with palpatory method first followed by auscultatory method using a stethoscope. Only one reading was taken as routine. A second reading was taken after a gap of five minutes for those with systolic blood pressure (SBP) ≥140 mmHg and diastolic blood pressure (DBP) ≥90 mmHg. We have classified the blood pressure measurements according to the guidelines published by the Association of Physicians of India. Random blood sugar measurement was done with a capillary blood sample using a digital glucometer (Sensa Core Medical Instrumentation Pvt. Ltd, India). Random blood sugar measurements of 140 mg% and above were labelled as high blood sugar as per the Operational Guidelines for Non–Communicable Diseases from the Government of India.

Proportion of vaccinees volunteering for health check-ups during the study period was a study variable for measuring acceptability. Screening yield was measured as a proportion of newly detected hypertensives and diabetics among the screened vaccinees. Approval from Institutional Human Ethics Committee of the affiliated medical college was taken. Written informed consent was taken from vaccinees participating in this screening.

**Data collection**

The health screening was conducted by trained staff, during the waiting time after the vaccinee received the vaccine, while following COVID-appropriate behaviour.

Counselling and advice for primary or secondary prevention of NCDs was provided, as applicable. The vaccinee was provided with relevant printed leaflets containing health education content (e.g., healthy lifestyle, breast self-examination, hazards of tobacco, alcohol, cervical cancer) and a slip mentioning their risk score, and blood pressure and blood sugar readings. Those detected with a risk score above 4 were advised regular health check-ups. The tobacco and alcohol users were made aware of the availability of counseling services at the medical college hospital. Those with freshly detected elevated blood pressure or blood sugar were referred for further evaluation to the medical outpatient department of our hospital, urban health center, or their family physician, whoever the vaccinee preferred. Those with an existing non-communicable disease were advised regular follow-up care.

The data was obtained on paper-based case record forms. It was converted to an electronic version on Microsoft Excel 2010. Data analysis was done on Microsoft Excel 2010.

**Results**

The COVID vaccination center received 7,878 vaccinees during the study period from 22 July to 30 September 2021. The Covishield and Covaxin vaccines were used at this center as per supply for the respective day. Out of 7,878 vaccinees in the July–September period, a total of 2,179 vaccinees (27.7%) volunteered to participate in this study. During the initial period of the screening at vaccination center, physical examination included blood pressure measurement only. Blood sugar measurement was started from September onwards due to operational issues. The vaccinees during this September month period (a subset of 2,522 out of 7,878) had an opportunity to undergo both blood pressure and blood sugar measurements. During this period, when blood sugar measurement could be done, only 209 (8.3%) out of 2,522 vaccinees to undergo blood sugar measurement. The younger vaccinees were hesitant to undergo blood sugar measurement. It took an average of seven minutes for screening of one vaccinee. The demographic profile of the participants given in Table 1 shows that males outnumbered females, and a majority of vaccinees came from urban residences.

The distribution of participants based on grades for individual items on the checklist is provided in Table 2. This shows that 66.7% of vaccinees were younger (18–39 years). We found a prevalence of current or past tobacco consumption at almost 25.9% and current alcohol consumption at 5.9% among vaccinees. Five hundred sixty-five tobacco users (96.1%) and 125 alcohol users (97.7%) were males. The prevalence of abdominal obesity was 42.7%. Six hundred forty-seven hypertensives (25.9%) and diabetics among screened vaccinees. For part A of the checklist, a score above 4 out of 10 was considered at risk for NCDs and counselled accordingly.

Table 3 shows the distribution of the total risk score of vaccinees as per the CBAC. Three hundred thirty-eight
participants (15.5%) had a score of more than 4 and thus were at increased risk. They were provided with guidance on risk reduction and were advised for regular health check-ups. The tobacco and alcohol users were provided information on the availability of cessation counseling services at our hospital.

Table 4 provides details on screening for high blood pressure among vaccinees. Four hundred fifty-two vaccinees (20.7%) were found to have blood pressure in the hypertension category. Overall, 421 vaccinees (19.3%) were newly detected to have blood pressure in the hypertensive category out of 2,019 vaccinees. We needed to screen five vaccinees to detect a new case of high blood pressure. Thirty-one (26.1%) of those who were known cases of hypertension had their blood pressure in hypertensive range at time of screening. Among vaccinees under 30 years of age, 143 vaccinees (18%) were newly detected to have high blood pressure out of the 794 vaccinees screened.

Table 5 provides details on screening for high blood sugar among vaccinees. Forty-one (19.6%) out of 209 vaccinees who volunteered to get the blood sugar test were screened positive. Overall, 22 vaccinees (10.5%) were newly detected to have blood sugar in the higher range out of 209 vaccinees screened. The number needed to screen to get one vaccinee with high blood sugar was 10. Nineteen (48.7%) of those who were known cases of diabetes mellitus had their blood sugar in a higher range at the time of screening.

**DISCUSSION**

To our knowledge, this is the first report of utilizing a COVID vaccination center for screening and counseling for non-communicable diseases. We report that around one-fourth of the vaccinees at the COVID vaccination center volunteered for the screening in general, while around 8% accepted blood sugar measurement. The number needed to screen to get a new vaccinee with high blood pressure and high blood sugar was 5 and 10, respectively.

People under the age of 40 years formed two-thirds of the vaccinees at our vaccination center. Many of the vaccinees came to receive their second dose of COVID vaccine. Since our medical college was an urban one, the majority of the vaccinees were from urban residences. The attendance at the vaccination center varied widely depending on the type of vaccine in supply. During the high attendance days, sometimes the two screening stations would not cope with the number of vaccinees, and this was one of the reasons for the low coverage of screening coming to around one-fourth of vaccinees in this study. Moreover, some persons did not wait for 30 minutes after the vaccine despite the team’s efforts. The other reasons for not volunteering for blood pressure measurement could be that it was not the primary purpose of visit, and younger people were less inclined to get their blood pressure measured.

The theoretical underpinning of this screening initiative was utilizing the COVID vaccination center’s visit for educating the vaccinees about non-communicable disease prevention. Earlier literature reports the utilization of hospital visits for tobacco cessation and physical activity advice.[8] We tried to apply this method to the healthy person’s voluntary visit to a health facility for seeking COVID vaccine. COVID vaccination has created this unique opportunity for such preventive visits for a large part of the adult population. Further, an inherent advantage of vaccination centers is that the advice received at a health facility is more likely to be accepted than that delivered through a community setting.

The proportion of vaccinees found with individual risk factors during this screening largely matched the prevalence of such risk factors among the adult population from previous large-scale studies. The tobacco and alcohol consumption reported in this screening was similar to that reported for urban adults in Gujarat according to NFHS 5 and among adults in the National Non-communicable Disease Monitoring Survey (NNMS).[5,11] Central obesity as measured by waist circumference was found in almost 43% of the vaccinees in this screening compared to the reported proportion of around one-third adults by NNMS.[5] Physical inactivity reported among around half of the vaccinees in this screening was reported at about 40% by NNMS.[10] The movement restrictions due to the pandemic, forcing people to stay home, may be partly responsible for the higher proportion of obesity and physical inactivity. We could not find previous studies reporting health screening at a COVID vaccination center to compare our findings. We observed that around 16% of vaccinees had a risk score higher than 4 on the CBAC. Previous studies from urban OPD attendees from Jammu have shown this to be at 28%.[12]

Upon combining 5.5% known case and 19.3% newly detected cases, the prevalence of hypertension from our data comes to be around 24.8% whereas this proportion among urban male and females from NFHS was 13.6% and 10.5%, respectively.[11] The reasons could be that our data included people of ages beyond 49 years where prevalence is expected to be higher and at-risk people are more likely to attend the vaccine clinic. Hence, our data should not be used to estimate the prevalence of hypertension in the general population.[11] This screening could detect high blood pressure in a one in five vaccinees. The national program on

| Table 1: Demographic profile of study participants | \(N = 2179\) |
|-----------------|-----------------|
| **Variable**    | **Participants, n (%)** |
| Gender          |                              |
| Male            | 1241 (57.0)        |
| Female          | 938 (43.0)         |
| Residence       |                              |
| Urban           | 1877 (86.1)        |
| Rural           | 302 (13.9)         |
| Vaccine type    |                              |
| COVISHIELD      | 1732 (79.5)        |
| COVAXIN         | 447 (20.5)         |
Looking at similar yield among vaccinees below 30 years of age in this study, it would also be worth offering blood pressure measurement to this age group.

The acceptability of blood sugar measurement was low overall compared to blood pressure measurement. Only around one-third of those volunteering for blood pressure measurement volunteered for blood sugar measurement. The reason for this was the fear of invasive screening procedure. This low acceptability was especially apparent among the young vaccinees. Still, this screening could detect high blood sugar in a substantial proportion of vaccinees who volunteered for such measurement. The proportion of vaccinees with high blood sugar was around 20% in this screening which is similar to that suggested by NFHS 5 findings. This proportion may be overestimating the prevalence of high blood sugar among vaccinees as the ones at high risk are more likely to have volunteered for testing thereby escalating the prevalence. This prevalence should be read with caution looking at small sample size.

The ongoing covid vaccination program in the country offers an opportunity to screen the vaccination center attendees for non-communicable diseases. In our study, the screening was done by internee doctors, but this can be performed by the para-medical staff also. The staff deputed at the COVID vaccination center can be utilized to offer such screening. Since this screening is expected to be carried out during the waiting time after vaccination, it does not add to the time burden for vaccinee. When the non-communicable disease control program faces challenges in coverage and quality of population-based screening,[13] such screening intervention can be tried for wider reach with population-based.

The study limitations are inadequate sample size for the blood sugar estimation and inability to give estimate of hypertension prevalence among population because of the possibility of selection bias. It would be meaningful to compare our findings with that of other similar studies at vaccination sites and not to the general population.

Table 2: Risk assessment of the vaccinees as per community-based assessment checklist (N = 2179)

| Criteria                        | Range          | Grade | Number (%) |
|---------------------------------|----------------|-------|------------|
| Age                             | 18–39 years    | 0     | 1453 (66.7) |
|                                 | 40–49 years    | 1     | 389 (17.9)  |
|                                 | ≥50 years      | 2     | 337 (15.5)  |
| Consumption of Tobacco or Smoking | Never         | 0     | 1614 (74.1) |
|                                 | Used to consume in the past/ Sometimes now | 1 | 149 (6.8) |
|                                 | Daily          | 2     | 416 (19.1)  |
| Consumption of alcohol daily    | No             | 0     | 2051 (94.1) |
|                                 | Yes            | 1     | 128 (5.9)   |
| Measurement of waist (in inches) | Female         |       |            |
|                                 | 80 cm or less  |       |            |
|                                 | 81–90 cm       |       |            |
|                                 | More than 90 cm|       |            |
|                                 | Male           |       |            |
|                                 | 90 cm or less  |       |            |
|                                 | 91–100 cm      |       |            |
|                                 | More than 100 cm|      |            |
| Physical activities in a week   | ≥150 minutes in a week | 0 | 1037 (47.6) |
|                                 | <150 minutes in a week  | 1 | 1142 (52.4) |
| Family history of NCD           | No             | 0     | 1491 (68.4) |
|                                 | Yes            | 2     | 688 (31.6)  |

Table 3: Distribution of risk score of vaccinees as per community-based assessment checklist (N = 2179)

| Score range | Number (%) |
|-------------|------------|
| 0–2         | 1053 (48.3)|
| 3–4         | 788 (36.2) |
| 5–6         | 274 (12.6) |
| 7–8         | 63 (2.9)   |
| 9–10        | 1 (0.04)   |

Table 4: Screening for high blood pressure among vaccinees (n = 2179)

| Blood pressure | Known case of hypertension | Not a known case of hypertension | Total vaccinees |
|----------------|----------------------------|----------------------------------|-----------------|
| Hypertensive category * | 31 (26.1) | 421 (20.4) | 452 (20.7) |
| Non hypertensive category † | 88 (73.9) | 1639 (79.6) | 1727 (79.3) |
| Total            | 119 | 2060 | 2179 |

Table 5: Screening for high blood sugar among vaccinees (n = 209)

| Blood sugar level (mg%) | Known case of diabetes mellitus | Not a known case of diabetes mellitus | Total vaccinees |
|-------------------------|----------------------------------|--------------------------------------|-----------------|
| ≥140                    | 19 (48.7)                        | 22 (12.9)                            | 41 (19.6)       |
| <140                    | 20 (51.3)                        | 148 (87.1)                           | 168 (80.4)      |
| Total                   | 39                               | 170                                  | 209             |

the prevention of non-communicable diseases advocates yearly screening of blood pressure for populations above 30 years of age.[8] Looking at similar yield among vaccinees below 30 years of age in this study, it would also be worth offering blood pressure measurement to this age group.
CONCLUSION
This study shows that overall screening was acceptable to 27.7% of the vaccinees. Around 15.5% of vaccinees had a high-risk score as per the community-based assessment checklist. The yield of freshly detected high blood pressure and high blood sugar was 19.3% and 10.5%, respectively. The yield was similar even among vaccinees under 30 years of age. Offering health screening at the COVID vaccination centre is worth the effort.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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