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Effect of Mobile-Phone Reminder Intervention on the Yield of Opportunistic Screening for Diabetes Mellitus at a Tertiary Care Teaching Hospital in Puducherry: A Randomized Trial

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Abstract

Background: Opportunistic screening for diabetes mellitus is cost-effective in resource-poor settings, but the yield may be limited by poor follow-up for confirmatory testing.

Objective: To compare follow-up rates for definitive diabetes tests among eligible outpatients who received mobile-phone reminders with those who did not, and to determine the screening yield attributable to the reminder intervention.

Methods: A facility-based, parallel, non-blinded randomized controlled trial was conducted among eligible outpatients attending the General Medicine OPD of SLIMS, Puducherry. Participants were randomized using block randomization with block size four. The intervention consisted of a standardized mobile-phone call reminder to return for definitive testing; up to three calls were made if the participant was not reached. Intention-to-treat analysis was followed.

Results: A total of 242 eligible OPD patients were included (intervention, n=120; control, n=122). Diabetes was diagnosed in 48 (40.0%) participants in the intervention group compared with 29 (23.8%) in the control group (p=0.003). The risk ratio for returning for definitive testing was 1.73 (95% CI 1.28–2.32; p<0.001), and the risk ratio for diagnosing diabetes was 1.68 (95% CI 1.14–2.47; p<0.001). The attributable screening yield was 16.2% (95% CI 4.6–27.8; p<0.001).

Conclusion: A simple mobile-phone reminder was feasible and effective in improving the yield of opportunistic screening for diabetes mellitus.

1. Introduction

The diabetic population in India is close to reaching 80 million by 2030. Almost 30–80% of diabetes mellitus cases remain undiagnosed, and 20–30% of individuals are identified only after complications. Opportunistic screening is cost-effective in resource-poor settings; however, its yield may be reduced because participants do not return for follow-up confirmatory testing.

Mobile-phone reminders provide a simple approach to improve follow-up after an abnormal screening result. The present randomized trial evaluated whether a mobile-phone reminder could improve the rate of return for definitive testing and increase the yield of diabetes diagnosis among eligible outpatients.

2. Materials and Methods

2.1. Study Design and Setting. A facility-based, parallel, non-blinded randomized controlled trial was conducted in the General Medicine OPD of SLIMS, Puducherry.

2.2. Participants. Participants were outpatients attending routine OPD who fulfilled the eligibility criteria and were willing to participate. Inclusion criteria were age ≥30 years, all genders, and random blood sugar (RBS) ≥6.1 mmol/L. Exclusion criteria were known diabetes mellitus, pregnancy or lactation, screening for diabetes within the previous year, disorientation, requirement for emergency care, and absence of personal mobile-phone ownership.

2.3. Sample Size. The calculated sample size was 240 using OpenEpi software version 3.0. The calculation assumed that 85% of eligible outpatients in the intervention arm and 53% in the control arm would return for definitive tests, with an alpha error of 5%, power of 95%, and 1:1 allocation. For subgroup analysis, the calculated sample size was doubled.

2.4. Randomization. Block randomization with block sizes of four was used. A random allocation software program was used to generate the random sequence.

2.5. Intervention. Participants in the intervention arm received a mobile-phone call reminder to return for definitive testing. The script was prepared and used uniformly for all participants. If the participant was not reached during the first call, a maximum of three calls were made at one-hour intervals. Participants in the control arm did not receive the mobile-phone reminder.

2.6. Procedure and Biochemical Measurements. Institutional Ethics Committee approval was obtained (2022-48-EMP-02; STS 2022-04229). RBS was tested using a glucometer after written informed consent. Participants with impaired RBS were instructed to undergo confirmatory testing. Only participants in the intervention arm received the evening phone reminder. American Diabetes Association criteria were used for diagnosis of diabetes mellitus. RBS was measured using a validated Accu-Chek glucometer in the Biochemistry Department. Fasting blood sugar (FBS) and postprandial blood sugar (PPBS) were measured using an auto-analyser at the central laboratory with a 2-mL blood sample.

2.7. Statistical Analysis. Data entry was performed using EpiData Manager Software version 4.2, and data analysis was performed using SPSS statistical package version 24. Screening yield, attributable screening yield, and number needed to screen were calculated. Intention-to-treat analysis was followed.

3. Results

A total of 242 eligible OPD patients were included in the analysis: 120 in the intervention group and 122 in the control group. Baseline characteristics were comparable between the two groups. Mean age was 47.8 (6.0) years in the intervention group and 48.7 (7.2) years in the control group (p=0.32). The proportion of males was 63.3% and 63.9%, respectively (p=0.92). Mean RBS was 144.7 (28.6) mg% in the intervention group and 143.3 (19.7) mg% in the control group (p=0.66).

The intervention group showed a significantly higher diabetes screening yield than the control group: 48 (40.0%) versus 29 (23.8%), respectively (p=0.003). Pre-diabetes was identified in 11 (9.2%) participants in the intervention group and 6 (4.9%) in the control group. Loss to follow-up was lower in the intervention group, 52 (43.3%), than in the control group, 82 (67.2%).

The risk ratio for returning for definitive testing was 1.73 (95% CI 1.28–2.32; p<0.001), while the risk ratio for diagnosing diabetes mellitus was 1.68 (95% CI 1.14–2.47; p<0.001). The attributable screening

yield was 16.2% (95% CI 4.6–27.8; p<0.001), and the etiological fraction was 40.6% (95% CI 12.6–59.6; p<0.001).

Table 1. Baseline characteristics of eligible OPD patients during opportunistic screening for diabetes mellitus (N=242)

Characteristics	Intervention (N=120)	Control (N=122)	p value
Age in years [Mean (SD)]	47.8 (6.0)	48.7 (7.2)	0.32
Gender – Male	76 (63.3%)	78 (63.9%)	0.92
Gender – Female	44 (36.7%)	44 (36.1%)	
RBS in mg% [Mean (SD)]	144.7 (28.6)	143.3 (19.7)	0.66

Values are presented as mean (SD) or number (percentage).

Table 2. Effect of opportunistic screening of eligible OPD patients for diabetes mellitus (N=242)

Effectiveness of Screening	Intervention	Control	p value
Diabetes (Yield)	48 (40.0%)	29 (23.8%)	0.003*
Pre-Diabetes	11 (9.2%)	6 (4.9%)	
Lost to follow up	52 (43.3%)	82 (67.2%)	
RR (95% CI) for returning to definitive test	1.73 (1.28–2.32)		<0.001*
RR (95% CI) for diagnosing DM	1.68 (1.14–2.47)		<0.001*
Attributable screening yield (95% CI)	16.2% (4.6–27.8)		<0.001*
Etiological fraction (95% CI)	40.6% (12.6–59.6)		<0.001*

*Statistically significant.

4. Discussion

The present randomized trial demonstrates that a simple mobile-phone reminder can improve follow-up for definitive diabetes testing after opportunistic screening. The intervention group had a substantially higher proportion of participants diagnosed with diabetes and a lower proportion lost to follow-up than the control group.

The observed risk ratio of 1.73 for returning for definitive testing indicates that the reminder intervention was associated with a marked improvement in follow-up. The risk ratio of 1.68 for diagnosing diabetes and the attributable screening yield of 16.2% further indicate that the intervention contributed meaningfully to the increased screening yield.

The intervention was simple and feasible because it used a standardized telephone script and could be implemented through routine health-care personnel. The findings support the use of mobile reminders as

a practical strategy to strengthen opportunistic screening programmes, particularly in settings where follow-up is a major limitation.

5. Conclusion

Simple mobile-phone reminders were feasible and effective in improving the yield of opportunistic screening for diabetes mellitus. The intervention could be implemented across countries, including poor-performing states, and could be carried out by peripheral health-care providers.

6. References

1. Kumar S, Shewade HD, Vasudevan K, Durairaju K, Santhi VS, Sunderamurthy B, Krishnakumari V, Panigrahi KC. Effect of mobile reminders on screening yield during opportunistic screening for type 2 diabetes mellitus in a primary health care setting: a randomized trial. Preventive Medicine Reports. 2015;2:640–644. doi:10.1016/j.pmedr.2015.08.008.
2. Shewade HD, Kumar S, Vasudevan K, et al. Mobile reminders to improve opportunistic screening of type 2 diabetes mellitus: data documentation and data analysis plan of a randomized trial data. Data in Brief. 2016;6:817–819. doi:10.1016/j.dib.2016.01.037.
3. World Health Organization. HEARTS D: Diagnosis and Management of Type 2 Diabetes. Geneva: World Health Organization; 2020. WHO Reference Number: WHO/UCN/NCD/20.1.
4. World Health Organization. Screening Programmes: A Short Guide. Increase Effectiveness, Maximize Benefits and Minimize Harm. Copenhagen: WHO Regional Office for Europe; 2020.
5. Hou C, Carter B, Hewitt J, Francisa T, Mayor S. Do mobile phone applications improve glycemic control (HbA1c) in the self-management of diabetes? A systematic review, meta-analysis, and GRADE of 14 randomized trials. Diabetes Care. 2016;39(11):2089–2095. doi:10.2337/dc16-0346.
6. Wu Y, Yao X, Vespasiani G, et al. Mobile app-based interventions to support diabetes self-management: a systematic review of randomized controlled trials to identify functions associated with glycemic efficacy. JMIR mHealth and uHealth. 2017;5(3):e35. doi:10.2196/mhealth.6522.
7. Kebede MM, Pischke CR. Popular diabetes apps and the impact of diabetes app use on self-care behaviour: a survey among the elderly population with type 2 diabetes. Diabetes Research and Clinical Practice. 2019;158:107918.
8. Barengo NC, Diaz Valencia PA, Manuel Apolina L, et al. Mobile Health Technology in the Primary Prevention of Type 2 Diabetes: a systematic review. Current Diabetes Reports. 2022;22(1):1–10. doi:10.1007/s11892-021-01445-w.
9. Bassi G, Roca A, et al. The impact of automated brief messages promoting lifestyle changes delivered via mobile devices to people with type 2 diabetes: a systematic literature review and meta-analysis of controlled trials. Journal of Medical Internet Research. 2016;18(11):e288.
10. Jahan E, Almansour R, Ijaz K, et al. Smartphone applications to prevent type 2 diabetes: a systematic review and meta-analysis. American Journal of Preventive Medicine. 2024;66(6):1060–1070. doi:10.1016/j.amepre.2024.01.008.