Equity impact of participatory learning and action community mobilisation and mHealth interventions to prevent and control type 2 diabetes and intermediate hyperglycaemia in rural Bangladesh: analysis of a cluster randomised controlled trial

Ma P s,[1] Sa t S a a,[2] Ca a K ,[3] J a a M s ,[1] Ta s Na a ,[2] Nav A ,[2] Ha a a Ma a J s,[4] K A t ,[2] Hassa Ha a ast-B ,[1] A K Aza K a ,[1]

RESULTS

At the end-of-study cross-sectional survey, data were collected from 11 454 (83.7%) of 13 687 individuals. In the villages assigned to the control arm, physical measurements (blood glucose, blood pressure and anthropometry) and interview survey data were gathered from 3785 (83%) individuals; 44 (1%) provided only physical measurements, and 1 (<1%) completed only the interview survey. In the mHealth arm, 3797 (83%) completed the physical measurements and interview survey; 15 (<1%) completed physical measurements only; and 5 (<1%) completed the survey only. In the PLA arm, 3786 (83%) completed the physical measurements and interview survey; 12 (<1%) completed the physical measurements only; and 9 (<1%) completed the survey only.[20]

From the intermediate hyperglycaemia cohort identified during the baseline cross-sectional survey (n=2470), 704 (85%) in the control arm, 666 (84%) in the PLA arm and 714 (85%) in the mHealth arm were followed up.[20] Some of the individuals in the intermediate hyperglycaemia cohort also happened to be randomly selected as part of the end-of-study cross-sectional survey (198 in the control sample, 214 in the PLA sample and 196 in the mHealth sample).

There were more male non-responders than female non-responders (1712 (23%) of 7520 men vs 721 (9%) of 7854 women, p<0·001). Male non-responders were younger than male responders (mean difference 2.0 years, p<0·001), whereas female non-responders were slightly older than female responders (mean difference 3.1 years, p<0·001). Reasons for non-response and loss to follow-up included death, pregnancy, migration and refusal.[20]

Reach of the interventions

Reach of the interventions was assessed among all individuals who participated in the end-of-study survey from the cross-sectional sample.

Table 1

(85.2% vs 76.5%), but marital status was not associated with participation among men. Both men and women who participated in groups were more likely to be working compared with non-participants.

Table 2 describes sociodemographic parameters among individuals exposed to and those not exposed to the mHealth intervention. Gender distribution was similar between those who were exposed to mHealth messages and those who were not. Significant differences in age for both men and women were observed, with mHealth exposed individuals more likely to be in the 30–39 years age group (32.6% of the exposed group vs 19.6% of the non-

2-year cumulative incidence remains statistically significant ($p < 0.003$) only in women and the most poor.

No significant impacts of the mHealth intervention on cumulative incidence of T2DM were observed. However, a potential intervention effect may be apparent in the youngest (30–39) age group (0.53, 95% CI 0.28 to 1.00; $p = 0.05$).

PLA and mHealth interventions had large positive impacts across all gender, age and wealth groups in relation to knowledge and awareness about the causes, symptoms, complications, prevention and control of diabetes, and, among individuals with diabetes, diabetes control and self-awareness of diabetic status (online supplemental table S3). There was no evidence of effects of either mHealth or PLA on secondary outcomes of blood pressure, overweight and obesity, quality of life and well-being, psychological distress among self-re

DISCUSSION

Our analysis of the impact of a PLA intervention across age, gender and wealth groups shows that despite socioeconomic differences in participation in PLA groups, the intervention achieved large, significant reductions in occurrence of intermediate hyperglycaemia and T2DM in all gender and wealth groups and in all but the oldest age group in communities where PLA was implemented. Exposure to the mHealth intervention was greater among younger, better educated individuals. Although mHealth intervention effects on primary outcomes were not observed in most groups, indications of a potential effect on 2-year incidence of T2DM among 30–39 year olds with intermediate hyperglycaemia may indicate a role for targeted mHealth interventions in diabetes prevention in high-risk individuals.

While we saw some differences in who participated in PLA groups, impacts were relatively consistent. An explanation for this could be in the way PLA works at the community rather than individual level. There is evidence that non-participants might have been motivated to control and prevent diabetes through interacting with group participants and through the creation of an enabling environment for behaviour change. This helps explain how the benefits of the intervention spread across different groups.[23] Interventions to improve maternal and newborn health in low-income and middle-income countries (LMICs) found that PLA increases confidence and motivation of group participants as well as non-participants from the community, leading to an increase in healthy behaviours at a population level.[30] Similarly, our results demonstrate that all sectors of society benefited from the intervention and explain an equitable impact even in the absence of equal participation.

The PLA intervention had an equitable impact in men and women. Meetings held in groups segregated by gender may have made it easier for women and men to participate, with groups organised at times and locations convenient to participants and aligned with cultural norms. Group discussions and larger community meetings enabled men and women to come together to plan actions and may have made household conversations about dietary changes easier. For example, women could cook vegetables and less oily food without being criticised by their husbands, and families grew their own vegetables. Women also felt more able to ask for support to seek healthcare.[23 24 31]

Although participation in PLA meetings was higher in the younger age groups of women, the impact of PLA on combined prevalence of T2DM and intermediate hyperglycaemia was observed in all age groups. However, an impact on cumulative incidence of T2DM among the cohort with intermediate hyperglycaemia was not observed in people above 60 years of age. It has been shown that there can be significant reversal of intermediate hyperglycaemia to normoglycaemia in middle-aged people who undergo behavioural interventions such as increased exercise and dietary restrictions,[32] but those who are 60 years and above are more likely to progress to T2DM.[33] It is arguable that if PLA works better to reduce the incidence of T2DM among people under 60 years of age, then this would be the ideal demographic to target in future interventions. Thus, it is important to explore how PLA works among different age groups in future process evaluations.

Although participation in groups was greatest among people in the second wealth tertile (poor), positive impacts of PLA were observed across all socioeconomic strata. This ‘diffusion effect’ of PLA impact across socioeconomic strata was also reported by Houweling and colleagues, although in relation to neonatal health outcomes.[34] Therefore, even though approximately 40% of people in PLA clusters reported not directly engaging with the intervention, the hypothesised mechanism of widespread community mobilisation underlying PLA may explain the observed positive impact on the community as a whole. Simple and clear interaction about diabetes and the development of local low-cost solutions to individual and community issues may have made it easy for poorer households to implement and respond to them.

Overall, high exposure to the mHealth intervention was observed, with over 80% of individuals in mHealth clusters receiving or knowing someone who received a message. Widespread accessibility and usage of mobile phones throughout the community explains this. Men and women were equally likely overall to be exposed to mHealth, and there was a higher likelihood for both male and female recipients to be younger and more educated. Marital status did not change the likelihood of receiving messages among men but did among women, where married women were significantly more likely to receive messages. This may be explained by mobile phone ownership in Bangladesh being much higher among men, and thus, married women more readily accessing a mobile phone.[35 36] Women in the poorest wealth tertiles were more likely to receive the intervention. This may be because wealthier women are often subject to restrictions and may not have been able to give their number and register for the intervention. Poor women have less access to the out-of-pocket healthcare system and thus may have been more interested in registering for an intervention that was free.[37] Despite the large exposure to the mHealth intervention, the passive, information-giving health-promoting nature of the intervention, while effective at raising understanding and awareness of diabetes, did not achieve changes in primary outcomes.

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the likelihood of type II errors.[41] Our interpretation of results therefore emphasises effect size estimates and their CIs in relation to scientifically and biologically plausible effects as part of a prespecified equity analysis of trial data. Further limitations of our analysis relate to small numbers in some subgroups, where we may have been underpowered to detect intervention effects.

CONCLUSIONS

PLA community mobilisation for diabetes prevention and control is an effective and equitable population-level intervention. Further research should be conducted to evaluate the effect of PLA in rural areas of other LMICs with a similar high burden of T2DM. PLA should also be adapted and piloted in urban areas in Bangladesh to inform possible country-wide scale-up of the intervention. mHealth health-promoting interventions may have a role to play in improving health outcomes in certain high-risk groups and as part of multicomponent, multisectorial responses to diabetes risk.

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