Mobile phone access and comfort: Implications for HIV and tuberculosis care in India and South Africa

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Mobile phone access and comfort: implications for HIV and tuberculosis care in India and South Africa

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SUMMARY

SETTING: India and South Africa shoulder the greatest burden of tuberculosis (TB) and human immunodeficiency virus (HIV) infection respectively, but care retention is suboptimal.

OBJECTIVE: We conducted a study in Pune, India, and Matlosana, South Africa, 1) to identify the factors associated with mobile phone access and comfort of use, 2) to assess access patterns.

DESIGN: A cross-sectional study assessed mobile phone access, and comfort; a longitudinal study assessed access patterns.

RESULTS: We enrolled 261 participants: 136 in India and 125 in South Africa. Between 1 week and 6 months, participant contact decreased from 90% ($n=122$) to 57% ($n=75$) in India and from 93% ($n=116$) to 70% ($n=88$) in South Africa. In the latter, a reason for a clinic visit for HIV management was associated with 63% lower odds of contact than other priorities (e.g., diabetes mellitus, maternal health, TB). In India, 57% ($n = 78$) reported discomfort with texting; discomfort was higher in the unemployed (adjusted OR [aOR] 4.97, 95%CI 1.12–22.09) and those aged ≥35 years (aOR 1.10, 95%CI 1.04–1.16) participants, but lower in those with higher education (aOR 0.04, 95% CI 0.01–1.14). In South Africa, 91% ($n = 114$) reported comfort with texting.

CONCLUSION: Mobile phone contact was poor at 6 months. While mHealth could transform TB-HIV care, alternative approaches may be needed for certain subpopulations.

KEY WORDS: mHealth; retention; cascade of care

TO SUCCESSFULLY TREAT TUBERCULOSIS (TB) and human immunodeficiency virus (HIV) infection, health programmes must maintain continuity of care with patients from diagnosis through treatment completion, or face the personal and public health implications of non-adherence.[1–3] India and South Africa shoulder the greatest burden of TB and HIV respectively,[4] but care retention is suboptimal. In 2016, India accounted for 26% of TB deaths globally.[4] In South Africa, only 56% of the 7.1 million people living with HIV are on appropriate antiretroviral therapy (ART).[5] There is a need for innovative and effective ways to access, engage, and retain patients in care to change the trajectory of these two deadly epidemics.[6–8]

"Mobile-health" (mHealth) is the use of mobile and wireless technologies for health care.[9] With mobile phone networks reaching 90% of the global population, mHealth could revolutionise TB-HIV programmes by overcoming barriers such as gender inequities, social stigma, and geographic isolation.[10–13]

A systematic review found that mHealth innovations in HIV/STIs (sexually transmitted infections) are acceptable and feasible, and can significantly improve adherence to ART and clinic attendance.[6] mHealth can also promote HIV-TB knowledge, while substantially reducing the burden on health care systems.[14,15] However, the extent of mHealth's effectiveness remains unclear.[8,9,16–19] Some studies have suggested that mHealth interventions may be less effective in reaching or impacting males, older adults in rural areas,[20,21] and those with lower education or decreased utilisation of health services.[22]

In 2012, the World Health Organization developed an mHealth evidence reporting and assessment (mERA) checklist to help standardise and improve

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the quality of mHealth interventions. An essential criterion of this checklist is evaluating "individual-level structural, economic, and social barriers or facilitators" to assess a participant's ability and willingness to adopt an mHealth intervention.[9]

We conducted a study in Pune, India, and Matlosana, South Africa, to 1) identify the factors associated with mobile phone access, comfort of use, and 2) understand long-term mobile phone access patterns.

STUDY POPULATION AND METHODS

Study design

We conducted a cross-sectional survey to assess participant demographics, mobile phone access and comfort, followed by a longitudinal study to determine long-term access patterns among adult patients (≥18 years) in Pune and Matlosana between 2014 and 2016. We contacted each participant who self-reported mobile phone ownership at 1 week, 1 month, 3 months and 6 months post-enrolment from a designated study phone. At each time point, up to three call attempts were made to each participant's primary mobile phone number across different days and times. We did not contact alternative phone numbers regardless of the number of subscriber identity module (SIM) cards a participant reported. During enrolment, we informed participants that they would receive four calls over a 6-month period.

In India, we recruited adults diagnosed with TB from an urban public TB clinic at Sassoon Government Hospital (SGH) and from ongoing TB studies at Byramjee Jeejeebhoy Medical College (BJMC)/SGH. In South Africa, we recruited adults from four, peri-urban public clinics serving the general population, including (but not restricted to) TB-HIV patients. For both sites, we used convenience sampling to identify and enrol participants from clinic waiting rooms. After research staff had obtained informed consent, trained interviewers administered standardised questionnaires to collect information on sociodemographics as well as on mobile phone access, use, attitudes and behaviour. Survey content varied between the sites due to adaptation for local context. South African participants were also asked about travel costs to clinics and which test results they would be comfortable receiving via mobile phone.

Data analysis

We used descriptive statistical analyses to assess the frequencies of characteristics across the study population. Secondary analyses using χ^2, Fisher's exact or Kruskal-Wallis tests (as appropriate) and univariate odds ratios (ORs) compared the characteristics of participants with comfort using mobile phones with those who expressed discomfort, as well as those who were contacted at 6 months versus those who were not. We included variables significantly associated at the univariate level ($P < 0.05$), or those determined to be important a priori, in a multivariable logistic regression. To evaluate successful contact through mHealth callbacks over time, we used Kaplan–Meier survival analysis. All analyses were performed using Stata v13 (StataCorp, College Station, TX, USA).

Ethical considerations

Ethical clearance was obtained from the Ethics Committee, BJMC/SGH, Pune, India, the University of the Witwatersrand Human Research Ethics Committee, Soweto, South Africa, and the Johns Hopkins University Institutional Review Board, Baltimore, MD, USA. All subjects provided written informed consent before enrolment.

RESULTS

From 2014 to 2016, we enrolled 261 adults; 136 in India and 125 in South Africa.

India

The median age was 32 years (range 23–45); 70% ($n = 95$) of participants were male; 43% ($n = 59$) had attended junior college or higher education (Table 1). Most participants ($n = 100$, 74%) resided in an urban setting—32% ($n = 44$) in low-income slums without basic amenities. All participants in India were diagnosed with active TB.

Of the 136 participants, 78% ($n = 106$) were primary owners of their mobile phone, with more men owning mobile phones than women (84% vs. 63%; $P = 0.01$). Most participants ($n = 85$, 79%) reported ownership of their current mobile phone for more than 1 year. The median number of people and mobile phones per household was 5 (interquartile range [IQR] 4–6) and 2 (IQR 1–3) respectively. The majority of households had one ($n = 43$, 32%) or two ($n = 55$, 40%) SIM cards. All participants who did not own a mobile phone had access to a mobile phone through a family member. Ninety-six percent of participants ($n = 131$) accessed a mobile phone daily. The most common type of phone was one without smartphone capabilities (i.e., basic phone with no internet data access) ($n = 102$, 75%). When asked about comfort in receiving and sending a short messaging service (SMS) or text message, 57% ($n = 78$) of participants stated that they were either uncomfortable, very uncomfortable, or had never received an SMS (Table 2).

South Africa

Compared with India, the median age in South Africa was higher (43 years, range 32–54, $P < 0.001$). Unlike India, the majority of participants in South Africa were female ($n = 97$, 78%) and not married ($n = 80$, 64%). Half of all participants were unemployed

Table 1 Demographic characteristics

	India ($n = 136$) n (%)	South Africa ($n = 125$) n (%)	Total ($n = 261$) n (%)
Sex			
Male	95 (70)	28 (22)	123 (47)
Female	41 (30)	97 (78)	138 (53)
Age, years			
18–34	75 (57)	36 (29)	111 (43)
≥35	57 (43)	89 (71)	146 (57)
Education			
None–secondary	77 (57)	92 (74)	169 (65)
Junior college or higher	59 (43)	33 (26)	92 (35)
Unemployment			
Employed	110 (81)	63 (50)	173 (66)
Unemployed	26 (19)	62 (50)	88 (34)
Household income			
High	41 (30)	63 (50)	104 (40)
Low*	91 (67)	60 (48)	151 (58)
Missing	4 (3)	2 (2)	6 (2)
Marital status			
Single/not married	40 (29)	80 (64)	120 (46)
Married	96 (71)	45 (36)	141 (54)
Children			
No	41 (30)	10 (8)	51 (20)
Yes	82 (60)	115 (92)	197 (75)
Missing	13 (10)	0 (0)	13 (5)
Persons in household, n, median [IQR]	5 [4–6]	4 [3–6]	4 [3–6]
Reason for clinic visit (i.e., top clinic priority)			
TB care	136 (100)	2 (2)	138 (53)
HIV care	—	69 (55)	69 (26)
Hypertension care	—	27 (22)	27 (10)
Other†	—	26 (21)	26 (10)
Missing	—	1 (1)	1 (0.4)

* Low income ≤ INR10 000 (US$155) or ZAR1000 (US$85) in total monthly household income in India and South Africa respectively
† Includes diabetes mellitus care ($n = 7$), maternal health care ($n = 6$), as well as free response answers such as "illness/pain", "pregnancy test", "family planning", "pap smear", "arthritis" or "accompanying a family member/friend".
IQR = interquartile range; INR = Indian rupee; ZAR = South African rand.

Table 2 Details of mobile phone use and comfort

	India ($n = 136$) n (%)	South Africa ($n = 125$) n (%)	Total ($n = 261$) n (%)
Own a mobile phone			
No	29 (21)	1 (1)	30 (11)
Yes	106 (78)	124 (99)	230 (88)
Missing	1 (1)	0	1 (0)
Access mobile phone			
Always access (daily)	131 (96)	118 (94)	249 (95)
Not always access (sometime–never)	4 (3)	7 (6)	11 (4)
Missing	1 (1)	0	1 (0)
Smartphone			
No	102 (75)	76 (61)	178 (68)
Yes	32 (24)	49 (39)	81 (31)
Missing	2 (1)	0	2 (0)
Mobile phones owned by the household, n, median [IQR]	2 [1–3]	2 [2–3]	2 [1–3]
Comfort receiving and sending an SMS			
Comfortable	58 (43)	114 (91)	172 (66)
Uncomfortable	78 (57)	10 (8)	88 (34)
Missing	0	1 (1)	1 (0)

IQR = interquartile range; SMS = short messaging service.

($n = 62$), although 74% ($n = 92$) were educated up to secondary level. Three-fourths of participants ($n = 94$) resided in a formal house, with 20% ($n = 25$) living in a shack or informal dwelling. The most common reason for their clinic visit (i.e., top clinic priority) was HIV care ($n = 69$, 55%) (Table 1).

Nearly all South African participants owned a mobile phone ($n = 124$, 99%). The median number of people and mobile phones owned per household was four (IQR 3–6) and two (IQR 2–3) respectively. Two or more SIM cards were regularly used by 26% ($n = 32$) of participants. Ninety-four percent of participants ($n = 118$) indicated daily access to a mobile phone and 61% ($n = 76$) indicated no one else had access to their phone. Similar to India, most owned a basic phone ($n = 76$, 61%) and SMS was the most regularly utilized feature ($n = 108$, 86%). Most participants ($n = 114$, 91%) indicated that they were comfortable or very comfortable receiving and sending SMS (Table 2).

When asked how they would like to receive test results through a mobile phone, 69% ($n = 86$) preferred SMS/text, 18% ($n = 22$) phone call, 5% ($n = 6$) WhatsApp™ (Facebook, Menlo Park, CA, USA)/WeChat™ (Tencent, Shenzhen, China)/Mixit™ (Akzo Nobel, Amsterdam, The Netherlands) and 2% ($n = 2$) Unstructured Supplementary Service Data (USSD)/pin-protected/toll-free; 4% ($n = 5$) preferred in-person results. Participants were willing to receive the following test results via mobile phone: cervical swab/pap smear ($n = 49$, 39%), TB sputum ($n = 26$, 21%), HIV viral load ($n = 16$, 13%) and/or CD4+ count ($n = 14$, 11%) results. The majority of participants ($n = 65$, 52%) had no concerns with receiving test results through mobile phones, but some expressed concerns about privacy/confidentiality ($n = 17$, 14%), personal connection with clinic staff ($n = 15$, 12%) or time to receive results ($n = 11$, 9%). The median amount participants were willing to pay to receive test results was 10 ZAR ($0.83 US dollars).

Comfort and contact (India and South Africa)

In the adjusted analysis, odds of discomfort with SMS among participants in India were significantly higher in unemployed (OR 4.97, 95%CI 1.12–22.09) and age ≥35 years (OR 1.10, 95%CI 1.04–1.16) participants, but significantly lower in those with junior college education or higher (OR 0.04, 95%CI 0.01–1.14) (Table 3). Due to the high comfort level among South Africans with SMS ($n = 114$, 91%), we did not assess their odds of discomfort.

In India, the ability to contact participants decreased steadily from 90% ($n = 122$) at 1 week to 57% ($n = 75$) at 6 months ($P \leq 0.001$). Similarly, in South Africa, 93% ($n = 116$) of participants could be contacted at 1 week vs. 70% ($n = 88$) at 6 months ($P = 0.001$) (Table 4, Figure). In South Africa, a partici-

Table 3 Demographic characteristics and correlates of comfort using SMS among adult patients ($n = 136$) attending a clinic in Pune, India, 2014–2015

	Total ($n = 136$) *n* (%)	Comfortable ($n = 75$) *n* (%)	Not comfortable ($n = 61$) *n* (%)	*P* value	Univariate OR (95% CI)	*P* value	Multivariate OR† (95% CI)	*P* value
Age, years, median [IQR]	32 [23–45]	26 [21–37]	40 [29–51]	<0.001	1.08 [1.0–1.11]*	<0.001*	1.10 [1.04–1.16]*	0.001*
Sex				0.09		0.10		0.51
Male	95 (70)	48 (64)	47 (77)		Reference		Reference	
Female	41 (30)	27 (36)	14 (23)		0.52 (0.25–1.13)		0.67 (0.20–2.21)	
Education				<0.001		<0.001*		<0.001*
None–secondary level	77 (57)	22 (29)	55 (90)		Reference		Reference	
Junior college and higher	59 (43)	53 (71)	6 (10)		0.05 (0.02–0.12)*		0.04 (0.01–1.14)*	
Employment				0.31		0.31		0.04*
Employed	110 (81)	63 (84)	47 (77)		Reference		Reference	
Unemployed	26 (19)	12 (16)	14 (23)		1.56 (0.66–3.69)		4.97 (1.12–22.09)	
Household income				0.02		0.007		0.09
Low	91 (67)	43 (57)	48 (79)		Reference		Reference	
High	41 (30)	30 (40)	11 (18)		0.33 (0.15–0.73)		0.34 (0.10–1.19)	
Marriage				<0.001		<0.001*		0.57
Single/other	40 (29)	32 (43)	8 (13)		Reference		Reference	
Married	96 (71)	43 (57)	53 (87)		4.93 (2.06–11.80)*		1.54 (0.35–6.83)	
Children				0.007		0.03*		
No	41 (30)	27 (36)	14 (23)		Reference		—	—
Yes	82 (60)	37 (49)	45 (74)		2.35 (1.08–5.11)*		—	—
Reading				<0.001		<0.001*		
Limited proficiency	26 (19)	4 (5)	22 (36)		Reference		—	—
Full proficiency	106 (78)	71 (95)	35 (57)		0.09 (0.03–0.28)*		—	—
Smartphone				<0.001		<0.001*		
No	102 (75)	43 (57)	59 (97)		Reference		—	—
Yes	32 (24)	30 (40)	2 (3)		0.05 (0.01–0.21)*		—	—

* Significant at $P < 0.05$ comparing comfort and discomfort using the χ^2 test for dichotomised variables, and Kruskal-Wallis test for age.
† Variables included in the multivariable logistic regression were age, sex, education, employment, household income and marriage. Certain variables not included in multivariate analysis due to concerns of high correlation (e.g., children with age and marriage; reading with education). Smartphone not included in multivariate analysis due to low numbers.
SMS = short messaging service; OR = odds ratio; CI = confidence interval; IQR = interquartile range.

pant's primary reason for a clinic visit being HIV or hypertension care was associated with 63% (adjusted OR [aOR] 0.37, 95%CI 0.25–1.79) and 84% (aOR 0.16, 95%CI 0.25–1.79) lower odds of contact respectively, than those interested in prioritising other care (e.g., diabetes mellitus, maternal health, TB) (Table 5). No variables were found to be associated with mobile phone contact in India.

DISCUSSION

Even though most participants had daily mobile phone access, the ability to contact participants by mobile phone at 6 months was poor in India and South Africa. Forty-five percent of participants ($n = 59$) in India and 36% ($n = 45$) in South Africa could not be contacted at all four time points. A study in Brazil reported that mHealth improved ART adherence among women with HIV over 4 months.[23] However, given that the treatment duration for drug-susceptible TB is 6 months and HIV requires lifelong treatment,[1–3] considerations must be made when designing and implementing mHealth strategies to support TB-HIV treatment completion.

There were challenges in maintaining contact with participants over 6 months. First, the four time points for attempted contact in the present study were not continuous; a more formal programme may involve an increased frequency of communication with participants, leading to an increased ability to contact.[24] Second, approximately one quarter of our participants in South Africa owned and regularly used multiple SIM cards. This may have been due to new mobile phone provider "packages" that are less expensive than recharging a current plan, which tempts people to switch providers and thus get new SIM cards. This finding is in accordance with studies that cited multiple SIM cards to be barriers to mHealth, in addition to changes in the economic situation and availability of electricity (power outages, load shedding).[25] Though our study involved contacting only primary mobile phone numbers, clinics interested in mHealth interventions may benefit from obtaining consent to contact phone numbers from all SIM cards and members in the household to improve retention.[26–28] Other mHealth initiatives aiming to connect with patients outside the clinic are available and may improve the ability to contact participants. In South Africa, for example, MomConnect™ (National Department of Health, Pretoria, South Africa), a government mHealth initiative to support maternal health through weekly,

Table 4 mHealth call backs

	India ($n = 136$) *n* (%)	South Africa ($n = 125$) *n* (%)	Total ($n = 261$) *n* (%)
Week 1			
Contact*	122 (90)	116 (93)	238 (91)
No contact†	14 (10)	7 (6)	21 (8)
Missing‡	0	2 (2)	2 (1)
Died§	—	—	—
Month 1			
Contact*	111 (82)	105 (84)	216 (83)
No contact†	20 (15)	16 (13)	36 (14)
Wrong number	8	2	10
Missing‡	5 (4)	4 (3)	9 (3)
Died§	—	—	—
Month 3			
Contact*	98 (74)	99 (79)	197 (76)
No contact†	21 (16)	25 (2)	46 (18)
Wrong number	8	2	10
Not in service	1	0	1
Missing‡	14 (11)	1 (1)	15 (6)
Died§	3	—	3
Month 6			
Contact*	75 (57)	88 (70)	163 (63)
No contact†	33 (25)	37 (30)	70 (27)
Wrong number	9	4	13
Not in service	2	0	2
Missing‡	24 (18)	0	24 (9)
Died§	4	—	4
Overall success			
Contact*	72 (55)	77 (62)	149 (58)
No contact†	59 (45)	45 (36)	104 (40)
Missing‡	1 (1)	3 (2)	4 (2)
Died§	4	—	4

* Participant was reached via phone call or call back of the study phone.
† Participant was not reached, despite attempted call; participant was not reached; call was never attempted (e.g., no further calls made after indication of wrong number, phone not in service).
‡ Call was due, but not attempted (e.g., missing; no further calls made after indication of out of coverage or switched off).
§ Participant was not reached, or call was never attempted due to participant's death.

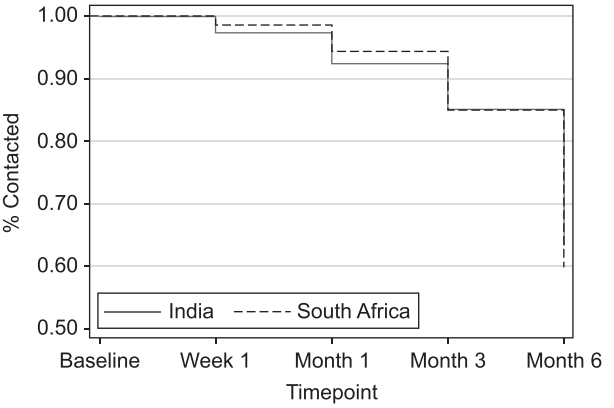

Figure Cumulative proportion of patients contacted at Week 1, Month 1, Month 3 and Month 6.

stage-based text messages, was active during our study.[29] Community familiarity with mHealth technology may positively influence comfort and the ability to contact participants.

This is the first study to investigate the ability to contact TB-HIV participants longitudinally. We found minimal qualitative data about mobile phone engagement in low- and middle-income countries over time. However, there were notable differences between the Indian and South African populations. Almost all participants enrolled in South Africa were comfortable using mobile phones for SMS, but more than half of the Indian participants were uncomfortable or had never used SMS before. Indians who were ≥35 years of age, unemployed, and less educated were more likely to be uncomfortable with sending and receiving SMS. In a 2017 mHealth study in rural southern India, older participants expressed limited use of basic mobile phones.[21] Thus, focused, repetitive education in certain subpopulations (e.g., older, unemployed, and/or less educated) may be helpful in improving retention in mHealth interventions.

SMS discomfort was not significant in the univariate analysis and thus not included in the multivariate analysis. Despite higher levels of discomfort in India, the cumulative proportion of participants contacted during follow-up was not significantly lower than that in South Africa (Figure). This finding suggests that SMS comfort in a location such as South Africa, where use of and comfort with mobile phones is high, is not a valid proxy for whether a participant will answer their phone when called by a health programme. In South Africa, "incorrect number" or "number out of service" messages were uncommon. Individuals may simply be not inclined to respond to a phone call from an unknown number. Additional research is needed to understand who may be vulnerable or under-served in an mHealth intervention and how barriers can be addressed to improve care in high TB-HIV settings.

There was a higher proportion of female participants in South Africa than in India, which may have been due to a higher unemployment rate[30] or higher utilization of health care services[31] among women in South Africa.[31,30] Only participants with TB were enrolled in India, whereas there were no inclusion criteria for disease for South Africans, of whom only two identified TB as their primary health concern (Table 1). This, coupled with the fact that estimated TB incidence is higher for males in India (63.7%),[4] may have contributed to the higher proportion of male participants in India. We found that having children may be associated with an increased ability to be contacted by mobile phone in South Africa. South African participants with a reason for a clinic visit for management of HIV or hypertension had lower odds of contact as opposed to participants coming in for other reasons (Tables 1 and 5). Further exploration of the reason for the clinic visit and contact is necessary to learn more about this association.

There were some limitations in our study. All participants were enrolled from public clinics, which may limit the generalisability of our results to the

Table 5 Demographic characteristics and correlates of mobile phone contact at Month 6 among adult patients ($n = 253$) attending clinics in Pune, India (2014–2015) and Matlosana, South Africa (2016)

	Total ($n = 253$) *n* (%)	Contact ($n = 149$) *n* (%)	No contact ($n = 104$) *n* (%)	*P* value	Univariate OR (95% CI)	*P* value	Multivariate OR† (95% CI)	*P* value
India and South Africa								
Age, years				0.54				0.53
18–35	111 (43)	60 (40)	49 (47)		Reference		Reference	
≥35	146 (57)	89 (60)	55 (53)		0.76 (0.46–1.25)	0.28	0.82 (0.44–1.53)	
Sex				0.16				0.90
Male	121 (47)	70 (47)	51 (49)		Reference		Reference	
Female	136 (53)	79 (53)	53 (51)		0.92 (0.56–1.52)	0.75	1.04 (0.57–1.90)	
Education				0.32				0.98
None–secondary level	166 (65)	96 (64)	66 (63)		Reference		Reference	
Junior college and higher	91 (35)	53 (36)	38 (37)		1.04 (0.62–1.76)	0.88	1.01 (0.57–1.79)	
Employment				0.79		0.99		0.63
Employed	170 (66)	99 (66)	69 (66)		Reference		Reference	
Unemployed	87 (34)	50 (34)	35 (34)		1.00 (0.59–1.71)		1.16 (0.64–2.09)	
Household income				0.71		0.35		0.65
Low	149 (58)	83 (56)	63 (61)		Reference		Reference	
High	103 (40)	64 (43)	38 (37)		0.78 (0.47–1.31)		0.88 (0.50–1.55)	
Marital status				0.15		0.62		0.74
Single/other	119 (46)	72 (48)	47 (45)		Reference		Reference	
Married	138 (54)	77 (52)	57 (55)		1.13 (0.69–1.87)		1.11 (0.59–2.11)	
Site				0.24		0.19		0.47
India	132 (51)	72 (48)	59 (57)		Reference			
South Africa	125 (49)	77 (52)	45 (43)		0.71 (0.43–1.18)		0.77 (0.37–1.57)	
SMS discomfort				0.83				
Comfortable	191 (74)	111 (75)	77 (74)		Reference			
Not comfortable	65 (25)	38 (26)	26 (25)		0.99 (0.55–1.76)	0.96		
Pune, India								
Age, years				0.61		0.64		0.95
18–35	75 (57)	42 (58)	32 (54)		Reference		Reference	
≥35	57 (43)	30 (42)	27 (46)		1.18 (0.59–2.36)		1.03 (0.42–2.49)	
Sex				0.22		0.41		0.50
Male	93 (70)	49 (68)	44 (75)		Reference		Reference	
Female	39 (30)	23 (32)	15 (25)		0.73 (0.34–1.56)		0.76 (0.33–1.72)	
Education				0.64		0.76		0.69
None–secondary level	74 (56)	41 (57)	32 (54)		Reference		Reference	
Junior college and higher	58 (44)	31 (43)	27 (46)		1.12 (0.56–2.23)		1.17 (0.53–2.59)	
Employment				0.88		0.91		0.92
Employed	107 (81)	58 (81)	48 (81)		Reference		Reference	
Unemployed	25 (19)	14 (19)	11 (19)		0.95 (0.39–2.28)		1.04 (0.42–2.59)	
Household income				0.87		0.65		0.82
Low	89 (67)	50 (69)	38 (64)		Reference		Reference	
High	40 (30)	21 (29)	19 (32)		1.19 (0.56–2.52)		1.10 (0.49–2.49)	
Marital status				0.79		0.82		0.82
Single/other	39 (30)	22 (31)	17 (29)		Reference		Reference	
Married	93 (70)	50 (69)	42 (71)		1.09 (0.51–2.31)		1.12 (0.42–2.95)	
Children				0.18		0.27		
No	40 (30)	18 (25)	22 (37)		Reference			
Yes	80 (61)	44 (61)	35 (59)		0.65 (0.30–1.40)			
Read				0.84		0.33		
Limited proficiency	26 (20)	12 (17)	14 (24)		Reference			
Full proficiency	103 (78)	58 (81)	44 (75)		0.65 (0.27–1.54)			
Smartphone				0.33		0.23		
No	98 (74)	51 (71)	47 (80)		Reference			
Yes	32 (24)	20 (28)	11 (19)		0.60 (0.26–1.38)			
SMS discomfort				0.51		0.81		
Comfortable	74 (56)	40 (56)	34 (57)		Reference			
Not comfortable	58 (44)	32 (44)	25 (42)		0.92 (0.46–1.84)			
Matlosana, South Africa								
Age, years				0.23		0.09		0.42
18–35	36 (29)	18 (23)	17 (38)		Reference		Reference	
≥35	89 (71)	59 (77)	28 (62)		0.50 (0.23–1.12)		0.67 (0.25–1.79)	
Sex				0.21		0.14		0.15
Male	28 (22)	21 (27)	7 (16)		Reference		Reference	
Female	97 (78)	56 (73)	38 (84)		2.04 (0.79–5.26)		2.19 (0.75–6.39)	
Education				0.51		0.62		0.35
None–secondary level	92 (74)	55 (71)	34 (76)		Reference		Reference	
Junior college and higher	33 (26)	22 (29)	11 (24)		0.81 (0.35–1.87)		0.63 (0.25–1.79)	
Employment				0.65		0.48		0.82
Employed	63 (50)	41 (53)	21 (47)		Reference		Reference	
Unemployed	62 (50)	36 (47)	24 (53)		1.30 (0.62–2.72)		1.11 (0.25–1.79)	

Table 5 (*continued*)

	Total ($n = 253$) *n* (%)	Contact ($n = 149$) *n* (%)	No contact ($n = 104$) *n* (%)	*P* value	Univariate OR (95% CI)	*P* value	Multivariate OR† (95% CI)	*P* value
Household income				0.63		0.16		0.35
Low	60 (48)	33 (43)	25 (56)		Reference		Reference	
High	63 (50)	43 (56)	19 (42)		0.58 (0.28–1.23)		0.65 (0.25–1.79)	
Marital status				0.06		0.85		0.39
Single/other	80 (64)	50 (65)	30 (67)		Reference		Reference	
Married	45 (36)	27 (35)	15 (33)		0.93 (0.43–2.01)		1.54 (0.25–1.79)	
Reason for clinic visit (i.e., top clinic priority)				0.07				
Other‡	29 (23)	13 (17)	16 (36)		Reference		Reference	
HIV care	69 (55)	43 (56)	24 (53)		0.45 (0.19–1.09)	0.08	0.37 (0.25–1.79)	0.05
Hypertension care	27 (22)	21 (27)	5 (11)		0.19 (0.06–0.65)*	0.008*	0.16 (0.25–1.79)*	0.008*
Children				0.08		0.04*		
No	10 (8)	3 (4)	7 (16)		Reference			
Yes	115 (92)	74 (96)	38 (84)		0.22 (0.05–0.90)*			
Smartphone possession				0.61		0.90		
No	76 (61)	47 (61)	28 (62)		Reference			
Yes	49 (39)	30 (39)	17 (38)		0.95 (0.45–2.03)			
Discomfort in using SMS				0.47		0.24		
Comfortable	117 (94)	71 (92)	43 (96)		Reference			
Not comfortable	7 (6)	6 (8)	1 (2)		0.28 (0.03–2.36)			

* Significant at $P < 0.05$ comparing contact and no contact using the χ^2 test.
† Variables included in the multivariable logistic regression were age, sex, education, employment, household income, marital status and site.
‡ Includes diabetes mellitus care ($n = 7$), maternal health care ($n = 6$), as well as free response answers such as "illness/pain", "pregnancy test", "family planning", "pap smear", "arthritis" or "accompanying a family member/friend.
OR = odds ratio; CI = confidence interval; SMS = short messaging service; HIV = human immunodeficiency virus.

government sector. We defined "no contact" as participants who could not be reached, despite attempted calls, or participants for whom a call was not attempted, due to "wrong number" or "not in service" indications. In India, no further calls were made after indication of the phone being "out of coverage" or "switched off," which may have lowered the success of contact as compared with South Africa (where calls were attempted regardless). In both countries, we could not assess if participants had died and did not collect data on adherence. Another notable limitation was that participants may have skewed their answers to please study staff, which could have caused respondents to downplay discomfort or express increased interest in an mHealth intervention. However, this is likely a challenge that health care providers face in real-life settings, and highlights an important barrier in implementing a successful long-term mHealth intervention.

CONCLUSION

Our study provides a unique insight into mobile phone comfort and ability to contact participants with TB-HIV in India and South Africa. Our findings indicate that, even though mobile phones are used widely and could increase access to essential TB-HIV services, long-term mHealth interventions may be less successful in certain subpopulations. Future studies should systematically evaluate mobile phone access in high-risk subpopulations (e.g., elderly, rural, low education) in settings with high TB-HIV burden that could benefit from an mHealth intervention, because there are greater implications for scale-up beyond feasibility.

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RÉSUMÉ

CONTEXTE : L'Inde et l'Afrique du Sud supportent le plus lourd fardeau de tuberculose (TB) et de virus de l'immunodéficience humaine (VIH), respectivement, mais la rétention en soins reste sous optimale.

OBJECTIF : Réalisér une étude à Pune, Inde, et Matlosana, Afrique du Sud, pour 1) identifier les facteurs associés à l'accès à un téléphone mobile, à l'aisance d'utilisation et 2) évaluer les profils d'accès.

SCHÉMA : Une étude transversale a évalué l'accès au téléphone mobile et à l'aisance d'utilisation; une étude longitudinale a évalué les profils d'accès.

RÉSULTATS : Nous avons enrôlé 261 participants : 136 en Inde, 125 en Afrique du Sud. Entre une semaine et six mois, le contact avec les participants a diminué de 90% ($n = 122$) à 57% ($n = 75$) en Inde et de 93% ($n = 116$) à 70% ($n = 88$) en Afrique du Sud. En Afrique du Sud, une consultation pour prise en charge du VIH a été associée avec 63% moins de chances de contact que d'autres priorités (par exemple le diabète, la santé maternelle, la TB). En Inde, 57% ($n = 78$) ont dit être mal à l'aise avec les sms; l'aisance a été meilleure chez les personnes au chômage (OR ajusté [ORa] 4,97 ; IC 95% 1,12–22,09) et les personnes d'âge $\geq$35 ans (ORa 1,10 ; IC 95% 1,04–1,16), et plus faible chez les personnes plus instruites (ORa 0,04 ; IC 95% 0,01–1,14). En Afrique du Sud, 91% ($n = 114$) ont dit être à l'aise avec les sms.

CONCLUSION : Le contact par téléphone mobile a été médiocre à 6 mois. Si la santé numérique a le potentiel de transformer la prise en charge du TB-HIV, des approches alternatives peuvent être requises pour certaines sous populations.

RESUMEN

MARCO DE REFERENCIA: La India y Suráfrica soportan la mayor carga de morbilidad por tuberculosis (TB) e infección por el virus de la inmunodeficiencia humana (VIH) respectivamente; sin embargo, la retención en los servicios de atención es deficiente.

OBJETIVO: Realizar un estudio en Pune, India, y en Matlosana, Suráfrica, tuvo por objeto: 1) reconocer los factores que se asocian con el acceso a la telefonía móvil y la comodidad de su utilización y 2) evaluar las características del acceso.

MÉTODO: En un estudio transversal se evaluó el acceso a la telefonía móvil y su facilidad de utilización y un estudio longitudinal evaluó las características del acceso.

RESULTADOS: Se inscribieron 261 participantes, a saber: 136 en la India y 125 en Suráfrica. Entre la primera semana y los 6 meses, la posibilidad de contactar a los participantes disminuyó un 90% ($n = 122$) a 57% ($n = 75$) en la India y un 93% ($n = 116$) a 70% ($n = 88$) en Suráfrica. En Suráfrica, en los participantes cuyo principal motivo de consulta se relacionaba con la infección por el VIH, la probabilidad de contacto fue un 63% más baja, que en los pacientes con otras prioridades de atención (por ejemplo, diabetes, salud materna, TB). En la India, el 57% de los pacientes ($n = 78$) refería falta de destreza al enviar o recibir mensajes de texto; la incomodidad era mayor en los desempleados (OR ajustado [ORa] 4,97; IC 95% 1,12–22,09) y en los participantes de edad $\geq$35 años (ORa 1,10; IC 95% 1,04–1,16) y se sentían más seguros los pacientes con un mayor grado de instrucción (ORa 0,04; IC 95% 0,01–1,14). En Suráfrica, el 91% de participantes refería destreza al utilizar los mensajes de texto ($n = 114$).

CONCLUSIÓN: El contacto por teléfono móvil fue deficiente a los 6 meses. Si bien las tecnologías de cibersalud (eSalud) ofrecen potencial para transformar la atención de la TB-VIH, se pueden necesitar otros métodos en determinados subgrupos de la población.