KNOWLEDGE AND ATTITUDES TOWARDS MOBILE PHONE USE TO PROMOTE MATERNAL AND CHILD HEALTH AMONG WOMEN IN MUSHIN, LAGOS STATE

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ABSTRACT
Mobile phone technology has been demonstrated to promote maternal and child health. However, its benefits are yet to be fully explored in Nigeria. The aim of this study was to determine the knowledge and attitudes towards the use of mobile phones to promote maternal and child health among women of reproductive age group (15 – 49 years) in Mushin, Lagos, Nigeria. In this descriptive cross-sectional survey, data was collected using an interviewer-administered questionnaire from 400 respondents who were selected by multistage sampling method. The mean age of respondents was 28.1±9.5years and 51% were married. Majority (93.5%) owned a mobile phone but only 23.5% subscribed to short message service (SMS) about health. About half of the respondents had good overall knowledge (51.3%) and positive attitudes (51%). Younger age and higher education were significantly associated with good knowledge and also significantly associated with positive attitudes (p<0.05). Although most women owned a mobile phone, knowledge and attitudes towards its use to promote maternal and child health were limited. Therefore, an increased enlightenment of its use is necessary as well as strengthening the partnerships between the health sector, community and the telecommunications industry.

Keywords: Maternal health, Child health, Reproductive age, Mobile health

INTRODUCTION
Maternal deaths are unacceptably high in developing countries. About 289,000 women died worldwide in 2013 due to pregnancy and pregnancy related conditions, almost all of which occurred in developing countries, especially Africa with Nigeria accounting for 14% of global maternal mortality ratio (WHO). Most women need access to health facilities, access to antenatal care, skilled health professionals and support, prevention of unwanted or too early pregnancies, access to family planning, safe abortion services to the extent of the law and adequate post abortion care (ECA *et al.*,2013). Daily, Nigeria loses about 2,300 under five year old children and 145 women of childbearing making it the second largest contributor to under-five and maternal mortality worldwide. Majority of the child deaths in the country are usually due to preventable causes (UNICEF Nigeria). There is thus an urgent need to improve the maternal and child indices in the country using innovative approaches such as mobile health (mHealth), which is the use of mobile communication and network technology for health care use (mAlliance).

mHealth is user-friendly and provides information about health risks, good health behaviors, available resources to mothers and children; enforcing new habits using text messages, pictures and videos to express the desired behavior, health monitoring and

surveillance, guiding them to embrace new healthy behaviors through monitoring, feedback, reminders, encouragement and reward giving; promoting intersectoral communication for social support and better access to health facilities (Rotheram-Borus *et al.*, 2012). Short message service (SMS) is an inexpensive method of communication and an effective medium to progress mHealth (Holton & Love, 2013).

With over six billion mobile phone subscribers around the world, mobile phone telecommunication technology has penetrated the world including the low and middle-income countries and has become an important tool in improving health quality and saving lives. This also creates an opportunity to achieve the fourth and fifth millennium development goals (MDGs) of reducing infant mortality rate and improving maternal health respectively by 2015 (Rotheram-Borus *et al.*, 2012).

Mobile phone use has been demonstrated to improve preparedness for motherhood and enhance healthy behavior among low-income pregnant women in America (Evans *et al.*, 2012). It has also improved health knowledge, utilization of antenatal care and immunization services and reduced delays in seeking health care for pregnancy-related complications in less developed countries (Kaewkungwal *et al.*, 2010; Tamrat & Kachnowski, 2012; Lund *et al.*, 2014).

In Nigeria, a recent and on-going mHealth intervention in Ondo state, the Abiye project has recorded success in reducing maternal mortality and has improved access to health information, communication between health care providers and pregnant women and improved clients' satisfaction with maternal health services (Oyeyemi & Wynn, 2014). However, despite the potential benefit of mobile phone technology in promoting maternal and child health particularly in resource limited setting, there is still a paucity of evidence in our setting to adequately inform policy formulation in this regard. We evaluated the knowledge and attitudes of women of reproductive age group towards the use of mobile phone technology in promoting maternal and child health. The study findings, which project the views of end-users of future mHealth interventions, will serve as a guide for program managers and researchers.

METHODOLOGY
Study Area
Mushin, an urban local government area (LGA) where this study was carried out is located in the heart of Lagos State and had a population of 637,341women as at the 2006 census (Lagos State Government, 2011). The LGA has 19 wards and majority of the residents are market traders, factory workers and manual workers. Several of the women are housewives and petty traders. Mobile phone usage is well established in the LGA with good network connectivity to all the major network providers.

Sampling Methodology
A sample size of 400 was calculated using formula $n = z^2pq/d^2$. Where n – sample size for population of > 10,000. Z – confidence interval set at 1.96 for 95% confidence level.

p – proportion in largest population estimated to have the particular characteristic of interest. q = 1-p. d – precision value/degree of error set at 0.05. Multistage sampling method was used to select respondents. First, one ward in the LGA was selected by simple random sampling. Second, ten streets in the ward were selected by simple random sampling. Third, the habitable houses on each street were enumerated (there was an average of 25 habitable houses on each street) and one household was selected in each house by simple random sampling and one eligible respondent was selected per household. If there was more than one eligible person, simple random sampling was used to select the respondent. A few houses did not have an eligible respondent; in that event, the next house was used.

Data Collection and Analysis
A structured, interviewer-administered questionnaire developed from previous literature (Balogun *et al.*, 2012; Greenstock *et al.*, 2012) was used to collect data. Ten trained interviewers who were 300 and 400 level medical students assisted with data collection after the questionnaire was pre-tested in Yaba LGA among women of reproductive age. The questionnaire collected information on socio-demographic data, mobile phone utilization, knowledge of mobile phone use to promote maternal and child health and attitudes towards mobile phone use to promote maternal and child health.

Collected data was analyzed using Epi-Info software statistical package version 7. Chi-squared test was to determine associations between socio-demographic variables and respondents' knowledge and attitudes. Level of significance was set at 0.05.

To determine composite scores for level of knowledge, each correct response to 8 knowledge questions was given a score of 1 while incorrect/don't know responses were given a score of 0. Respondents with aggregate scores below the mean score were classified as having poor knowledge and those with aggregate scores above the mean score were classified as having good knowledge. The respondents' attitudes were assessed using a 5 point Likert scale for 10 attitude statements. The overall attitude scores were graded as positive attitude for aggregate of 50% and above and negative attitude for less than 50%.

Ethical Consideration
Ethical approval was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital. In addition, permission was obtained from the Medical Officer of Health of the Local Government Area before the study was carried out. Written informed consent was obtained from the respondents and their confidentiality was maintained by not using identifiers.

RESULTS
The modal age group was 15-25 years and the mean age was 28.1years ± 9.5 SD. Most of the respondents were married (51%), Christians (62%), Yoruba (80.8%) and had secondary school education (58.3%) [Table 1].

Majority (93.5%) of the respondents owned a mobile phone and 57.8% of the respondents' phones were smart phones. Twenty-eight respondents (7.0%) were subscribed to routine text messages on health, 12(3.0)% had health applications on their mobile phone and 6(1.5%) had ever visited health related websites on phone (Figure 1).

The commonest sources of health-related information for respondents were health care providers (50.8%) and electronic media (44.3%). Most (59.3%) of the respondents knew healthy pregnancy tips could be gotten through mobile phone, 61.3% knew immunization information could be gotten through mobile phone, 78.3% knew antenatal appointment reminders could be gotten through mobile phone, 79.8% knew immunization reminders could be gotten by text message, 68.5% knew reproductive health information could be gotten through mobile phone, 84.3% knew mobile phones could make it easier to reach healthcare providers in case of emergencies, 70.3% knew mobile phone applications and 73.5% knew internet can be used to get information that promotes maternal and child health (Table 2).

Respondents most preferred source of health-related information was the healthcare provider 49.30%. Most (66%) of the respondents felt immunization reminders via mobile phone would be very beneficial. In addition, 76.3% of respondents preferred a reminder via text message to e-mail and 54.8% preferred a reminder via phone call to text message. Most (66.8%) of the respondents strongly agreed that women should seek health information. More (48.5%) respondents strongly agreed that health information should be available to everyone and 42.5% strongly agreed that health information aids better health decisions. More (40.5%) of the respondents strongly agreed that a doctor's advice cannot be replaced by health information obtained from the mobile phone, 15.8% strongly agreed that health information gotten from mobile phones is not reliable, 41.5% agreed that health information through mobile phone was cheap. More of the respondents (30%) agreed that mobile phone usage had increased their level knowledge on various health conditions. More (42.3%) agreed that mobile phone is a good way to access health information and in addition, 36.3% strongly agreed that they would use their phones to get health information. More of the respondents (38.5%) strongly agreed to encourage others to get maternal and child health information through their phones (Table 3).

The mean knowledge score of respondents was 5.8 ± 2.5 SD. Overall, 51.3% of the respondents had good knowledge while 48.8% had poor knowledge on mobile phone use to promote maternal and child health. There was statistically significant association between education and level of knowledge as higher proportions of respondents with secondary and tertiary education had good knowledge ($p<0.001$). There was also a statistically association between age and level of knowledge as higher proportions of respondents in the younger age groups had good knowledge ($p = 0.025$) [Table 4].

Overall, 51% of respondents had a positive attitude and 49% had a negative attitude towards mobile phone use to promote maternal and child health. Higher proportions of respondents with secondary and tertiary education had positive attitude; higher

proportions of respondents in younger age groups had positive attitude and a higher proportion (62.9%) of respondents with good knowledge had positive attitudes. These findings were statistically significant (p < 0.05) [Table 4].

DISCUSSION

There are currently over 170 million subscribers to the Global System Mobile communication (GSM) service in Nigeria (NCC, 2014). The use of mobile phones to promote maternal and child health has great potential as the number of subscribers keeps increasing. The ubiquitous existence of the mobile phones explains why almost all (93.5%) the respondents in the study owned one. Similarly, a facility-based study among women accessing care at an immuno-prophylaxis and child welfare clinic in Lagos University Teaching Hospital (LUTH), a tertiary hospital within Mushin LGA revealed that 98% of the women had mobile phones (Balogun *et al.*, 2012).

The smart phone has the ability to connect to the Internet on the go. In this study, 57.8% of respondents owned a smart phone; this could be because of higher costs and complexity compared to regular phones or access to Internet from other sources although that information was not sought in this study. Very small numbers of respondents were subscribed to routine health SMS, had health applications on phone or had visited health websites on their phones thus showing a poor use of mobile phone to access health information. With the respondents' mean age of 28 years, one would have expected a higher use of mobile phone to access health-related information as younger age has been linked with higher likelihood of seeking health related information over the Internet (Dickerson *et al.*, 2004). A population study in Japan also demonstrated low use (6%) of mobile phone to access health-related information (Takahashi *et al.*, 2011). However, 22% of migrants studied in Australia accessed health information via mobile phone (Greenstock *et al.*, 2012). Also, among undergraduates in USA where 52.4% used smart phones, a higher proportion than in our study (17%) had used an mhealth application on the phone within the last 30 days (Tamrat & Kachnowski, 2012). It is worthy of note that such applications are not as readily available in Nigeria as in developed countries such as USA.

The respondents' most common source and the most preferred source of health information were health care providers. Factual health information can be obtained from this source. However, in practice, the information obtained from health care providers may not meet the patients' needs especially when care is not patient-centered resulting in patients seeking additional health information through telecommunications (Kraschnewski *et al.*, 2014).

Only about half of respondents had good knowledge of the use of mobile phone to promote maternal and child health. This could be because of their unfamiliarity with using mobile phones to access health information. A study among kidney transplant patients in USA also demonstrated poor knowledge of the mobile phone use for remote monitoring (7%) although 90% of the respondents owned a mobile phone (McGillicuddy

et al., 2013). A possible implication of not having adequate knowledge is that these end-users of future mHealth interventions to promote maternal and child health may fail to appreciate the benefit of such interventions and may not participate fully in them. This point is underscored in this study as good knowledge was significantly associated with positive attitude towards mobile phone use to promote maternal and child health.

Most (66%) respondents appreciated the benefit of immunization appointment reminders via mobile phone but 54.8% would prefer phone calls to SMS. Similarly, 69% of the mothers in the LUTH study perceived the reminders to be very beneficial and 67% preferred phone call reminders (Balogun *et al.,* 2012). This could be because SMS is more impersonal than a phone call; future interventions should put into consideration the preference of end-users of mHealth services.

Similar to overall knowledge, only about half of the respondents had positive attitude. Some previous studies in USA had higher proportions of respondents that were receptive to mHealth interventions (McGillicuddy *et al.,* 2013; Price *et al.,* 2013). The preference for health information from health care providers could have contributed the attitudes observed in our study. For instance, over 80% felt health information should not be available to everyone, about 40% believed health information via mobile phone is not reliable and about 70% felt heath information over phone cannot replace a doctor's advice. Although, provider-patient communication in the developed world is being complemented significantly with online health information (Hou & Shim, 2010), there seems to be more confidence in health care providers and less trust in online information in our study. Future mHealth interventions should thus seek to get the endorsement of health care providers in order to ensure their usage within communities.

Younger age and higher education were significantly associated with both good knowledge and positive attitude. Younger and better-educated people are the ones who tend to use mHealth technology (Dickerson *et al.,* 2004). Thus, they are likely to know more about its use and have positive attitudes towards it. In relation to this study, it underscores the importance of female education, which has been shown to advance maternal and child health (The World Bank, 2014).

CONCLUSION

Although, almost all the respondents in this study owned a mobile phone, knowledge and attitudes towards its use to promote maternal and child health were limited. The health information-seeking behaviour was very low and respondents relied majorly on healthcare providers for health related information. Therefore, an increased enlightenment of its use is necessary as well as strengthening the partnerships between the health sector, community and the telecommunications industry.

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REFERENCES

Balogun, M.R., Sekoni, A.O., Okafor, I.P., Odukoya, O.O., Ezeiru, S.S., Ogunnowo, B.E. and Campbell, P.C. (2012). Access to information technology and willingness to receive text message reminders for childhood immunization among mothers attending a tertiary facility in Lagos, Nigeria. *SAJCH*. 6(3): 76-80.

Dickerson, S., Reinhart, A.M., Feeley, T.H., Bidani, R., Rich, E., Garg, V.K. and Hershey, C.O. (2004). Patient Internet use for health information at three urban primary care clinics. *J Am Med Inform Assoc*. 11(6):499–504.

ECA (Economic Commission for Africa), AU (African Union), AfDB (African Development Bank) and UNDP (United Nations Development Programme) (2013). MDG Report 2013: Accessing Progress in Africa towards the Millenium Development Goals. http://www.afbd.org.

Evans, W.D., Wallace, J.L. and Snider, J. (2012). Pilot evaluation of the text4baby mobile health program. *BMC Public Health*. 12:1031.

Greenstock, L.,Woodward-Kron, R., Fraser, C., Bingham, A., Naccarella, L., Elliot, K. and Morris, M. (2012). Telecommunications as a means to access health information: an exploratory study of migrants in Australia. *J Public Health Research*. 1: 216-221

Holton, A. and Love, B. (2013). Lonely no more: remembering text messaging in mHealth conversations. *Health Commun*. 28 (5):530-532

Hou, J. and Shim, M. (2010). The role of provider-patient communication and trust in online sources in Internet use for health-related activities. *J Health Commun*. 15 Suppl 3: 186-199.

Kaewkungwal, J., Singhasivanon, P., Khamsiriwatchara, A., Sawang, S., Meankaew, P. and Wechsart, A. (2010). Application of smart phone in "Better Border Healthcare Program": A module for mother and child care. *BMC Med Inform Decis Mak*. 10:69.

Kraschnewski, J.L., Chuang, C.H., Poole, E.S., Peyton, T., Blubaugh, I., Pauli, J., Feher, A. and Reddy, M. (2014). Paging "Dr. Google": does technology fill the gap created by the prenatal care visit structure? Qualitative focus group study with pregnant women. *J Med Internet Res*. 16(6): e147

Lagos State Government (2011). Lagos state population. http://www.lagosstate.gov.ng/pagelinks.php?p=6.

Lund, S., Nielsen, B.B., Hemed, M., Boas, I.M., Said, A., Said, K., Makungu, M.H. and Rasch, V. (2014). Mobile phones improve antenatal care attendance in Zanzibar: a clustered randomized controlled trial. *BMC Pregnancy Childbirth*. 14:29.

McGillicuddy, J.W., Weiland, A.K., Frenzel, R.M., Mueller, M., Brunner-Jackson, B.M., Taber, D.J., Baliga, P.K. and Treiber, F.A. (2013). Patient Attitudes Toward Mobile Phone-Based Health Monitoring: Questionnaire Study Among Kidney Transplant Recipients. *J Med Internet Res*. 15(1): e6.

mHealth Alliance. Frequently Asked Questions. http://mhealthalliance.org/about/faq.

NNC (Nigerian Communications Commission) (2014). Subscriber Statistics, May 2014. http://www.ncc.gov.ng.

Oyeyemi, S.O. and Wynn, R. (2014). Giving cell phones to pregnant women and improving services may increase primary health facility utilization: a case control of a Nigerian project. *Reprod Health*. 11:8.

Price, M., Williamson, D., McCandless, R., Mueller, M., Gregoski, M. and Brunner-Jackson, B. (2013). Hispanic Migrant Farm Workers' Attitudes Toward Mobile Phone-Based Telehealth for Management of Chronic Health Conditions. *J Med Internet Res*. 15(4): e76.

Rotheram-Borus, M.J., Tomlinson, M., Swendeman, D., Lee, A. and Jones, E. (2012). Standardized functions for smartphones applications: examples from maternal and child health. *Int J Telemed Appl*. Article ID 973237, 16 pages

Tamrat, T. and Kachnowski, S. (2012). Special delivery: an analysis of mHealth in maternal and newborn health programs and their outcomes around the world. *Matern Child Health J*. 16(5):1092-1101.

Takahashi, Y., Ohura, T., Ishizaki, T., Okamoto, S., Miki, K., Naito, M., Akamatsu, R., Sugimori, H., Yoshiike, N., Miyaki, K., Shimbo, T. and Nakayama, T. (2011). Internet use for health-related information via personal computers and cell phones in Japan: a cross-sectional population-based survey. *J Med Internet Res*. 13(4): e110.

The World Bank (2014). Press release: Education Plays Key Role in Advancing Women, Girls and Communities, Report Says. May 14, 2014. http://www.worldbank.org/en/news/press-release/2014/05/14/education-key-role-women-girls-communities-report.

UNICEF Nigeria. The children: Maternal and child health. http://www.unicef.org/nigeria/ children_1926.html.

WHO (World Health Organization) (2014). Media Center: Maternal Mortality. http://www.who.int/mediacenter/factsheets/fs348/en/.

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%) n=400
Age group (years)	
15-25	190 (47.5)
26-35	125 (31.3)
36-45	58 (14.5)
>45	27 (6.8)
Marital status	
Single	182 (45.5)
Married	204 (51.0)
Divorced	8 (2.0)
Widowed	6 (1.5)
Religion	
Christianity	248 (62.0)
Islam	151 (37.8)
Traditional	1 (0.3)
Tribe	
Hausa	4 (1.0)
Igbo	45 (11.3)
Yoruba	323 (80.8)
Others	28 (7.0)
Educational Level	
None	5 (1.3)
Primary school	67 (16.8)
Secondary school	233 (58.3)
Tertiary education	94 (23.5)
Quaranic school	1 (0.3)

Table 2: Sources of health-related information and knowledge of mobile use to promote maternal and child health

Variables	Frequency (%) n=400
*Sources of health-related information	
Newspaper/magazine	59 (14.8)
Television/radio	177 (44.3)
Research article/ Journal	17 (4.3)
Friends/Family	101 (25.3)
Mobile phones	107 (26.8)
Healthcare providers	203 (50.8)
Healthy pregnancy tips could be gotten through mobile phones	
Yes	237 (59.3)
No	87 (21.8)
Don't know	76 (19.0)
Immunization information could be gotten through mobile phone	
Yes	245 (61.3)
No	91 (22.8)
Don't know	64 (16.0)
Antenatal appointment reminder could be gotten through text message	
Yes	313 (78.3)
No	61 (15.3)
Don't know	26 (6.5)
Immunization reminders could be gotten through text message	
Yes	319 (79.8)
No	44 (11.0)
Don't know	37 (9.3)
Reproductive health information could be gotten through mobile phone	
Yes	274 (68.5)
No	53 (13.3)
Don't know	73 (18.3)
Mobile phones could be used to reach healthcare providers in case of emergency	
Yes	337 (84.3)
No	36 (9.0)
Don't know	27 (6.8)
Phone applications could be used to get information that promotes maternal and child health	
Yes	281 (70.3)
No	54 (13.5)
Don't know	65 (16.3)
The Internet could be used to get information that promotes maternal and child health	
Yes	295 (73.8)
No	40 (10.0)
Don't know	65 (16.3)

*Multiple responses allowed

Table 3: Respondents' attitudes towards health information via mobile phone

Variables	Frequency (%) n=400
Perceived benefit of immunization reminder via mobile phone	
Very beneficial	264 (66.0)
Somewhat beneficial	100 (25.0)
Prefers reminder via text message to e-mail	305 (76.3)
Prefers reminder via phone call to text message	219 (54.8)
Women should seek health information	
Strongly agree	267 (66.8)
Agree	118 (29.5)
Not sure	7 (1.8)
Disagree	8 (2.0)
Health information should be available to everyone	
Strongly agree	194 (48.5)
Agree	164 (41.0)
Not sure	23 (5.8)
Disagree	18 (4.5)
Strongly disagree	1 (0.3)
Health information helps to make better health decisions	
Strongly agree	170 (42.5)
Agree	196 (49.0)
Not sure	25 (6.3)
Disagree	9 (2.3)
Health information got through mobile phone cannot replace a doctor's advice	
Strongly agree	162 (40.5)
Agree	123 (30.8)
Not sure	50 (12.5)
Disagree	57 (14.3)
Strongly disagree	8 (2.0)
Health information through mobile phone is not reliable	
Strongly agree	63 (15.8)
Agree	97 (24.3)
Not sure	149 (37.3)
Disagree	79 (19.8)
Strongly disagree	12 (3.0)
Health information through mobile phone is cheap	
Strongly agree	48 (12.0)
Agree	166 (41.5)
Not sure	138 (34.5)
Disagree	42 (10.5)
Strongly disagree	6 (1.5)

Table 4: Factors associated with overall knowledge and attitude of respondents

| Variables	Overall knowledge		X^2	p - value
	Good Frequency (%)	Poor Frequency (%)		
Age group (years)			9.31	0.026
15-25	104(54.7)	86(45.3)		
26-35	68(54.4)	57(45.6)		
36-45	26(44.8)	32(55.2)		
>45	7(25.9)	20(74.1)		
Total	205 (51.3)	195 (48.8)		
Level of education				<0.001*
Primary school	19(28.4)	48(71.6)		
Secondary school	117(50.2)	116(49.8)		
Tertiary education	68(72.3)	26(27.7)		
Quaranic school	0(0)	1(100)		
None	1(20)	4(80)		
Total	205 (51.3)	195 (48.8)		
	Overall attitude			
	Positive Frequency (%)	Negative Frequency (%)		
Age group (years)			12.53	0.005
15-25	108(56.8)	82(43.2)		
26-35	66(52.8)	59(47.2)		
36-45	23(39.7)	35(60.3)		
>45	7(25.9)	20(74.1)		
Total	204 (51.0)	196 (49.0)		
Level of education				<0.001*
Primary school	18(26.9)	49(73.1)		
Secondary school	129(55.4)	104(44.6)		
Tertiary education	56(59.6)	38(40.4)		
Quaranic school	0(0)	1(100)		
None	1(20)	4(80)		
Total	204 (51.0)	196 (49.0)		
Overall knowledge			23.94	<0.001
Good	129 (62.9)	76 (37.1)		
Poor	75 (38.5)	120 (61.5)		
Total	204 (51.0)	196 (49.0)		

*Fishers' exact p-value
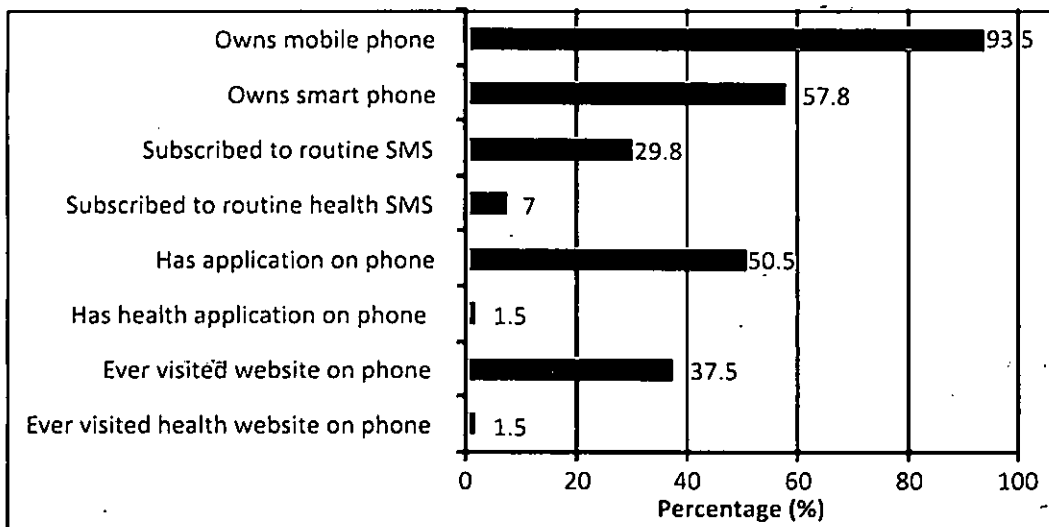
Fig. 1: Mobile phone utilization by respondents