International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064

Games to Combat Tuberculosis

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Abstract: ***Mobile learning is the convergence of mobile computing and e-learning. Mobile learning solutions are highly effective and mobile learning content delivery has been rated as a successful ICT based learning method for development communication and edutainment. Tuberculosis and HIV/AIDS have become serious health concerns in India. It is the youth that comprise the larger share of the patients afflicted by them. Several edutainment strategies using low cost mobile phones as media are being tried by national and international organizations to run awareness campaigns about these diseases. To study the efficacy of some of these games, two games on HIV and AIDS and Tuberculosis were selected. The games were tested on a sample of urban youth in Delhi. Semi structured interview schedules were used to collect data from the youth. An objective type awareness test on based on the information contained in the games was prepared and administered to the respondents before and after playing the games to assess any change in awareness about the diseases before and after playing the games. It was found that all the youth had played mobile phone games to entertain themselves and compete with their friends with in the privacy of their home or in public places as per their convenience. The mobile phone games were liked by a large number of respondents as they were reported to be easy to play, very interesting and challenging and entertaining. Almost all the youth wanted to acquire these games in their own mobile phones and share them with their friends and family. Most of the youth were not aware about the process of downloading such games in their phones. Analysis of the Awareness Test clearly indicated an increase in awareness about HIV and AIDS and Tuberculosis after playing the games. The youth gave several suggestions to improve the games. New mobile phone edutainment games were suggested on health (particularly reproductive health), social issues, and environment and on topics from the school syllabus of the youth. The youth expressed a keen desire to participate in designing mobile phone games for edutainment. Feedback from the youth clearly indicates that mobile phone based games are quiet successful in entertainment-education and thus should form an essential part of any development communication strategy.***

Keywords: mobile learning, mobile phone games, HIV and AIDS, Tuberculosis, development communication, health awareness.

1. Introduction

1.1 ICTs in Health Communication

ICTs are "general purpose technologies and permeate production and consumption activities" (Sciadis, 2003) and ICTs cover a broad range of services, applications and technologies using various types of contemporary equipments and software. Modern ICT services include cellular and mobile telephone, email transfer of files from one computer to another computer and the use of the internet. These services are called 'readiness' indicator (OECD 2001). The use of ICTs in the health sector also improves the collection, storage, retrieval and transmission of individual patient information including the application of tele-medicine. Thus, ICTs have the potential to contribute to more effective delivery of health services and to increase the efficiency of health systems.

1.2 Edutainment

According to Singhal, A and Dearing W. J (2006) quoting (Singhal and Rogers, 1999; 2002) Entertainment-education (E-E) is the process of purposely designing and implementing a media to both entertain and educate, in order to increase audience knowledge about an educational issue, create favorable attitudes, shift social norms, and change overt behavior. E-E is not a theory of communication. Rather, it is a communication strategy to bring about behavioral and social change. E-E approaches have tackled a wide variety of social issues, prevention, small family size, maternal and child health and gender inequality.

1.3 Games

Games are an exciting way to communicate and connect with a larger community of likeminded people. Rich mobile games, combined with connected near distance multiplayer gaming over Bluetooth opens the door for totally new gaming concepts. Mobility will add a whole new dimension to innovative and creative games concepts and will provide opportunities for the games and telecom industry alike (Goggin, 2010). The technology in the pockets of billions of the world's population provides a new platform for reconvening, designing and selling games for cell phones. In addition, cell phones are a new 'arena of innovation' (Sawhney and Lee 2005).

1.4 Mobile learning

Any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse. Mobile Learning is an ideal solution today as it facilitates learning anytime-anywhere. Mobile Learning is highly effective for social learning solutions like healthcare programs, awareness programs and literacy programs like basic numeracy and basic alphabetization for the communities with lesser literacy level (ZMQ, 2010).

1.5 HIV and AIDS: The Scenario

India has seen an increase in the number of its people living with Human Immuno Deficiency Virus (HIV) which causes Acquired Immuno Deficiency Syndrome (AIDS). According to a WHO report, the estimated number of persons living with HIV worldwide in 2010 was 34 million and estimated

number of deaths due to AIDS in 2010 was 1.8 million worldwide. Approximately 2.4 million people in India were living with HIV in 2010.

1.6 Tuberculosis: The Status

India is home to over 3.4 million tuberculosis patients- about one-fifth of the global figure- making it the most TB prevalent country. Of these, 17% have developed multi drug resistance ie, MDR TB (RNTCP, 2010). HIV-AIDS and TB are becoming growing concerns in India. It is the youth that comprise the larger share of their victims. Several edutainment strategies using a variety of media are being tried by national and international organizations to run awareness campaigns on these diseases. One such strategy is use of mobile learning through games. To explore into the domain of edutainment based mobile phone games, following two studies were conducted:

- Study I: Mobile Phone Games for Edutainment: An Exploratory Study (2008-9)
- Study II: Efficacy of Stop TB Cricket: a Mobile Phone Game for Edutainment (2010-11)

The present paper is based on the findings of both these studies.

1.7General objective of the present paper

To explore the range of mobile phone based edutainment games and field test some games as media of edutainment for youth.

1.8 Specific objectives

1. To identify edutainment based mobile phone games available in the Indian market.
2. To prepare a catalogue of the mobile phone edutainment games collected.
3. To find out the perceptions of youth regarding the ease of playing and appeal of AIDS Fighter Pilot and Stop TB Cricket (edutainment based mobile phone games).
4. To assess the efficacy of the selected games in changing the awareness of youth about HIV/AIDS and Tuberculosis.

To seek the opinion of the youth with respect to the use of mobile phone games for edutainment.

2. Methodology of the two Studies

2.1 Study I

Mobile phone edutainment games were collected after consulting agencies engaged in the development sector and mobile phone game developers. ZMQ Software Systems (India) was found to be the only organization developing mobile phone edutainment games on health concerns as part of its Corporate Social Responsibility initiative. All the mobile phone games developed by ZMQ Software Systems were analyzed in terms of- edutainment issue, phone specifications required, source, process of installing, method of playing, delivery of messages, entertainment value and gaming experience were analyzed. A catalogue was prepared and printed after reviewing the games. It contained the following information about the games: Title, edutainment issue, year of launch, genre, developer, web link, connectivity, operating system, handset required, language and visuals.

The game AIDS Fighter Pilot was selected for field testing as it did not have any male or female characters, its visuals could be easily identified and was easy to play. This game was available in English therefore it was selected for field testing with 80 youth (15-35 years) who could read English and belonged to middle income group families living in West Delhi. Since this was an exploratory study, the sample was further stratified to include an equal number of youth (16 each) engaged in five different occupation groups- school going, college going, homemakers, in service and self employed. This enabled the control of variables like age, education, geographical location and nature of occupation of the sample. All the respondents played the game on the same Motorola handset to control the variables of screen size, color resolution, key board controls. The study required a long period of interaction with the respondents as it involved an interview as well as before and after awareness test. Hence, purposive sampling was used to identify the sample.

2.2 Study II

The game Stop TB Cricket could be downloaded in Hindi and was field tested on 80 youth (15-25 years, equal number of male and female) local spoken language resettlement colony, living in a South-East Delhi. All the respondents played the game on the same Nokia handset to control the variables of screen size, color resolution, key board controls. Semi-structured interview schedules were designed to seek the opinion and perceptions of youth in both the studies. Based on the messages appearing in the games awareness tests were prepared. These were administered to the respondents before and after playing the games to assess any change in their awareness. Due to paucity of time, no subsequent testing was done to determine if information was retained over a period of time. The findings of the two studies are described below. They have been organized in the following sections:

3. Findings and Discussions

3.1 Review of Mobile Phone Edutainment Games on health

Seven mobile phone edutainment games disseminating messages on health were identified. These are listed in Table 1. A detailed description of the games was included in a catalogue which can be used as an off line reference material by development practitioners engaged in the field of edutainment.

Table 1: List of Mobile Phone Games on Health

S. No.	*Name of the Game*	*Issue*	*Year of Launch*
1.	AIDS Fighter Pilot	HIV and AIDS	1st Dec 2006
2.	AIDS Penalty Shootout	HIV and AIDS	1st Dec 2006
3.	Safety Cricket	HIV and AIDS	1st Dec 2005
4.	Ribbon Chase	HIV and AIDS	1st Dec 2005
5.	The Messenger	HIV and AIDS	1st Dec 2005
6.	Quiz with Babu	HIV and AIDS	1st Dec 2005
7.	Stop TB Cricket	Tuberculosis	24th March 2009

The catalogue contains information about each game in terms of edutainment issue, genre, year of launch, developer, web link for downloading connectivity, operating system, language(s) game available in and brief description of the game. The catalogue titled **Mobile Phone Edutainment Games**. Figure 1 shows the cover of the catalogue. Figure 2 shows an inside paper of the describing information about two games.

Figure 1: Catalogue Cover of Mobile Phone Games on Health

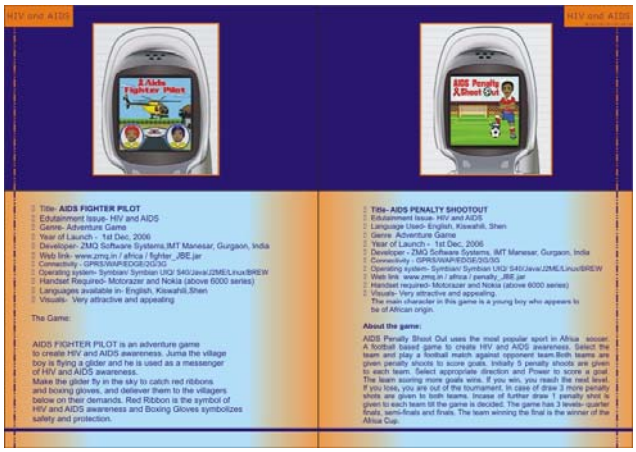

Figure 2: Inside pages of Catalogue of Mobile Phone Games on Health

3.2 A description of all the seven games on health is described in the section below:

3.2.1 Game I: AIDS Fighter Pilot

- Genre- Adventure Game
- Available in- English, Kiswahili and Shen

Juma the village boy is flying a glider and he is used as a messenger of HIV and AIDS awareness. The player is supposed to make the glider; fly in the sky to catch red ribbons and boxing gloves, and deliver them to the villagers below on their demands. Red Ribbon is the symbol of HIV and AIDS awareness and Boxing Gloves symbolizes safety and protection. There are 15 messages on HIV and AIDS in the game. The messages appear every time you score or lose a point or clear a level. The game contained messages on the causes, signs, symptoms, treatment, prevention and myths and misconception

3.2.2 Game II: AIDS Penalty Shootout

- Genre- Adventure game: Sports
- Available in- English, Kiswahili, and Shen

A football based game to create HIV and AIDS awareness. Select the team and play a football match against opponent team. Both teams are given penalty shoots to score goals. Initially 5 penalty shoots are given to each team. A player has to select appropriate direction and power to score a goal. The team scoring more goals wins. Players move to the next level if they win. If they lose**,** they are out of the tournament. The game has 3 levels- quarter finals, semi-finals and finals. The team winning the final is the winner of the Africa Cup.

3.2.3 Game III: Safety Cricket

- *Genre*- Educational game: Sports
- *Available in*- English, Telugu, Marathi, Kannada and Hindi

The game is based on a cricket match between Demons XI and Safety XI. Demons XI have played their innings and have set up a target score. Safety XI has to chase those runs in 10 over's (60 balls) and 300 seconds with 11 players in hand. Balls will appear regularly on the air in three different rows in form of 4 Safety symbols: Condom, Faithful Partner, HIV Information and AIDS Red Ribbon. You score runs for collecting these items. At the same time, Outs will appear in form of Unsafe Sex, Infected Blood Transfusion, HIV Virus, Infected Syringe and Company of bad friends. Different HIV and AIDS awareness and safety messages are displayed on scoring runs. On striking negative objects, messages are displayed on how HIV is transmitted. The players need to time their jump to hit the right ball.

3.2.4 Game IV: Ribbon Chase

- *Genre*- Educational game
- *Available in*- English, Telugu, Marathi, Kannada and Hindi

Ribbon Chase is for more focused people who are engaged in game play. The player needs to spread the message and awareness of HIV and AIDS all over the world. The player is an AIDS Red Ribbon, and HIV Virus is chasing you. Different cities in the world are asking for information on HIV and AIDS. You need to deliver them by going to them. The HIV Virus is chasing you and wants to catch you and is not letting you deliver the message. You need to run smartly

to deliver the required message. It is a highly exciting multi-level game with 5 Lives.

3.2.5 Game V: The Messenger

- Genre- Adventure game
- Available in- English, Telugu, Marathi, Kannada and Hindi

You are a HIV and AIDS Awareness Messenger in form of a Pigeon. You are flying from village to village. In the sky you can collect Condoms and Red Ribbons, which needs to be distributed to the villagers below. People living in the villages need Condoms and Red Ribbon to prevent HIV and AIDS. The Pigeon needs to drop the safety objects on specific demand of the villagers. On every correct demand, the villager gets an additional safety and awareness message. Beware the Pigeon can lose a life if it hits a HIV Virus in the sky, and different messages are displayed how HIV is transmitted.

3.2.6 Game VI: Quiz with Babu

- Genre- Interactive game
- Available in- English, Telugu, Marathi, Kannada and Hindi

Quiz with Babu involves users whose bent of mind is more towards quizzing, and they questioning and reasoning. Babu - the village boy is fond of going to school library. He reads a lot about HIV and AIDS in the library and newspapers. He is always busy searching information on HIV and AIDS from different sources. He has made a resolution to spread the HIV and AIDS awareness not only in is village but in the surrounding villages as well. In the evening hours, you can find Babu sitting under the tree in the village questioning people on HIV and AIDS and playing quiz with them. A gamer plays quiz with Babu and tests her knowledge on HIV and AIDS. Players have 10 questions and three lifelines to answer all his questions.

3.2.7 Game VII: Stop TB Cricket

- *Genre*- Interactive game
- *Available in*- English and Hindi

Stop TB Cricket is a game which uses cricket as a sport to deliver messages on Tuberculosis. In 'Stop TB Cricket' there is two teams – Safety XI and TB Germs XI. One has to bat and chase a set of score after choosing his or her team. After every shot, a dialogue box containing facts about the disease of information countering popular myths and misconceptions associated with it is displayed. When a player scores runs, information on how to prevent TB get displayed on screen. When a player loses a wicket, information on how TB is transmitted and its cure is flashed (Jha, 2011)

3.3 Findings from Study I: Mobile Phone Games for Edutainment: An Exploratory Study

3.3.1 Time taken to gain proficiency in playing AIDS Fighter Pilot

Average time taken by respondents to reach proficiency in playing the game was 5 minutes. The minimum time taken was 1 minute and the maximum time taken was 10 minutes. Majority of the respondents (67.5%) learnt to play AIDS Fighter Pilot in a single turn and even reached the score of 300. Thus, AIDS Fighter Pilot was found to be a very simple game, easy to learn and play.

3.3.2 Appeal of AIDS Fighter Pilot

Majority of the respondents (56%) found the game AIDS Fighter Pilot 'somewhat' interesting and engaging. About one-fourth of the respondents found the game 'very' interesting and engaging, 20% found the game 'moderately engaging' and the remaining reported that they did not find the game interesting or engaging at all. Pearson Chi Square Test was performed to see any association between age, sex, education and occupation of the youth with their finding the game interesting and engaging. It was found that there was no association between variables like age, sex, education and occupation of the respondents and their opinion about the appeal of the game.

3.3.3 Quality of graphics of AIDS Fighter Pilot

About 75% of the respondents found the quality of graphics in the game 'very good'. The graphics were simple, clear and colorful.

3.3.4 Clarity of instructions for playing AIDS Fighter Pilot

Majority of the respondents (60%) stated that the instructions for playing were 'very clear'. Only one respondent was not able to understand the instructions. Half the youth took less than one minute in understanding the instructions of the game, 42.5% took 2-5 minutes and the remaining few respondents took 6-10 minutes in understanding the instructions. Thus a majority of the respondents did not take more than 5 minutes to learn Aids Fighter Pilot.

3.3.5 Clarity of messages appearing in AIDS Fighter Pilot

60% of the respondents found the language of the messages in the game very easy and clear. Terms like, 'antiretroviral drugs' and 'safer sex' were not clear to many respondents. More than half of the respondents mentioned that the same message should not be repeated 3 to 4 times in quick succession as it made the game monotonous.

3.3.6 Ease of playing the game

Nearly 70% of the respondents found the game to be very easy to play. Only one respondent found the game difficult to play as he was not comfortable with the key board. All the respondents were made to play the game on the same Motorazer mobile phone. More than half of the respondents (62.5%) found the control of keys 'very easy'. The others faced some difficulty in controlling the keys.

3.3.7 Time taken in understanding instructions for playing the game

Half the youth took less than one minute in understanding the instructions of the game, 42.5% took 2-5 minutes and the remaining few respondents took 6-10 minutes in understanding the instructions. Thus a majority of the respondents did not take more than 5 minutes to learn Aids Fighter Pilot.

3.3.8 Efficacy of AIDS Fighter Pilot in enhancing awareness about HIV and AIDS

Awareness Score- Before playing the game: Respondents were given an Awareness Test of 20 questions based on messages appearing in the game. Each question carried one mark. It was found that the minimum score was 10 (for 2 respondents) and the maximum score 20 (for 15 respondents). The average score of the sample before playing the game AIDS Fighter Pilot was 17.48.

Awareness Score-After Playing the Game: The average awareness score of the youth after playing AIDS Fighter Pilot was 19.21. The minimum score obtained was 16 (for 1 respondent). The maximum score was 20 (for 44 respondents). More than three-forth of the respondents scored between 19-20 points after playing AIDS Fighter Pilot. The average gain in score after playing the game was 2 and the range of gain in score was 9. Awareness about HIV and AIDS was found to be significantly higher after playing AIDS Fighter Pilot. This was also confirmed statistically by applying the t test. Awareness about HIV and AIDS before playing AIDS Fighter Pilot was significantly related to the education of the respondents. No such relationship was found between age, sex and occupation of the respondents and their awareness about HIV and AIDS before playing AIDS Fighter Pilot. Awareness about HIV and AIDS after playing AIDS Fighter Pilot was found to be significantly related to the age, sex, education and occupation of the respondents. Thus it can be concluded that although all the respondents liked the game but they perceived HIV and AIDS to be associated with sex. They felt very shy in discussing sex and its association with HIV and AIDS.

3.3.9 Suggestions for improving AIDS Fighter Pilot

About 25% youth suggested improvement in the content and language of the messages. Respondents mentioned that the content delivered in the game was quite heavy. For instance messages like HIV and AIDS screening should be required for employment' and 'Learn to say no to peer pressure' were found to be difficult. Instead of these messages some messages on signs and symptoms could be included in the game. They wanted the language to be simpler as words like 'contagious', 'stigma', 'peer' and 'antiretroviral' were found difficult to understand. A few youth wanted greater ease of playing and better key pad design as the respondents did not find it easy to play the game on Motorazer phone as it was new to them and they were use to handling their own mobile phones.

3.3.10 Issues suggested for new mobile phone edutainment games

Youth suggested that such games should be made on topics like gender, environment, and nutrition and for providing academic support to students on topics from their syllabus in a fun format.

3.3.11 Willingness to have mobile phone edutainment games

Majority of the respondents were willing to have edutainment games in their mobile phones as they found them very informative and entertaining. Some respondents who were homemakers wanted to use the game AIDS Fighter Pilot to initiate a dialogue with their spouse and children on HIV, AIDS and Safe Sex.

3.4 Study II: Efficacy of Stop TB Cricket- a Mobile Phone Game for Edutainment

3.4.1 Objective of the game Stop TB Cricket

Although a majority of the youth (80%) stated that the game they played was about TB. However, the remaining 20% youth mentioned that the game was on cricket- of these a large number (75%) were girls.

3.4.2 Time taken to gain proficiency in playing Stop TB Cricket

A majority of the youth (90%) took only 1-2 times to play the game and develop proficiency in it. A similar trend was observed in both boys and girls. Thus, it can be concluded that the game Stop TB Cricket was easy to understand and play.

3.4.3 Ease of playing the game

The game was found easy to play by a majority of the youth. About 20% of the youth found the game 'very easy' to play and 53.7% reported that it was 'easy' to play. About one-fourth of the youth (26.3%) found the game 'difficult' to play.

3.4.4 Ease of understanding the instructions for playing the game

Half of the youth (50%) reported that they found the instructions for playing the game 'clear' where as 23.7**%** reported that they were 'very clear'. Nearly one-fourth of the youth (26.3%) reported that the instructions were 'unclear'- of these girls were found to be more in number as compared to boys.

3.4.5 Problems encountered while playing Stop TB Cricket

A large number of the youth (65%) did not report any problem in playing the game. However, the others reported problems related to size of buttons on handset, difficulty in understanding some instructions and some messages. It was observed that more girls than boys reported problems while playing the game.

3.4.6 Appeal of the game

Almost all the youth (95%) found the game quite appealing in general. A large number of the youth (70%) found the game very appealing. The TB game was based on cricket which is a very popular sport in India. This was cited as the main reason for liking the game.

3.4.7 Language of the Messages

It was found that only about one-third (36.2%) of the respondents found the messages in the game 'very clear', (57.5%) stated that they found the messages 'clear' and the few remaining found them 'unclear'. Although the game was in Hindi, the words used in some messages were found to be difficult to understand. For example, words like 'sankraman, DOTS pranalee, etc. were found difficult to understand.

3.4.8 Efficacy of Stop TB Cricket in enhancing awareness about Tuberculosis

To assess the effectiveness of Stop TB Cricket in enhancing the youth's awareness about Tuberculosis an Awareness Test comprising of 16 objective type questions was administered to the respondents before and after playing the game. Each question was given 1 mark. The average score on the Awareness Test before playing the game was found to be 10.7 and increased to 12.5 after playing the game. Hence, the average gain in score was 1.7. The gain in average awareness score was found to be more in female respondents (2.08) as compared to male respondents (1.8). The lowest score before playing the game was 6 and the highest score before playing the game was 15 amongst all the youth. The lowest score after playing the game was 9 and the highest score was 16. The minimum gain in score after playing the game was 1 and maximum was 7. A few respondents (5%) did not show any change in awareness score after playing the game.

Increase in the awareness scores clearly indicated that the game Stop TB Cricket was quite effective in increasing awareness of the youth about Tuberculosis. This was also confirmed by statistical analysis. The T-test and Chi-square test were done to measure the association between variables age, sex, occupation and increase in awareness scores before and after playing the game. The game Stop TB Cricket increases the awareness of youth about TB. The paired samples T test values were -11.147. df= 79 at 0.000 level of significance. The expected level of significance was 0.05.

It was concluded that awareness about TB after playing the game Stop TB Cricket was significantly higher amongst the youth. It was concluded that the game Stop TB Cricket is successful in increasing the awareness of youth about TB. It was also concluded that increase in awareness of youth about TB was significantly correlated to the education of the youth. Variables like age group, sex and occupation were not found to have any correlation with the performance of the youth on the awareness test. The figure no. 3 depicts the bar graph showing the Awareness Test Scores of youth- Before and After playing Stop TB Cricket and difference in Before and After Scores.

3.4.9 Willingness to acquire edutainment based mobile phone games

Nearly all the youth (93.7%) expressed willingness to acquire edutainment based mobile phone games in their phones as they found these games to be very informative and entertaining.

3.4.10 Issues suggested for making edutainment based mobile phone games

Most of the youth had a lot of suggestions to give about the kind of new mobile phone games they wanted to be developed. The youth suggested that new mobile phone games should be prepared on health (83.7%), social issues (12.5%) and environment (7.5%). They were found willing to participate in the game development process.

3.4.11 Suggestions for improving Stop TB Cricket

A lot of suggestions were offered to improve the game: 17.5% suggested that the game should have different types and levels, 16.2% wanted the content and language to be simpler, 13.7% wanted both male and female players in the game, 12.5% wanted better graphics and 10% wanted better readability in terms of larger font size and slower speed of scrolling of text. Figure 4 shows the youth playing the Stop TB Cricket.

3.4.12 Feedback from Experts- Analysis of messages appearing in the game

The experts from the field of Medicine, Natural Language Processing, Behavior Change Communication, Media and Communication and Development communication and Extension were contacted and explained the purpose of the study. They were given the Schedule as a print copy or on email. They were required to enter their responses in Yes or No and write suggestions for improving messages that they did not approve of. The schedule was designed in a manner that it was easy and quick to fill up. It took about 10-15 minutes to fill up this schedule.

Experts were asked to give their opinion about each message of the game in terms of accuracy, relevance and easy to understand. They were requested to suggest improvement in the structure of the messages. There were the total 16 messages in the game. It was found that the game contained no message on signs and symptoms of TB. A lay person identifies a disease by seeing certain signs and symptoms. Hence it was very important to have messages creating awareness about signs and symptoms of a disease. There were 3 messages on Causes, 4 messages on Diagnosis and Treatment, 4 messages on Prevention and 4 messages on Myths and Misconceptions on Tuberculosis.

Based on feedback from experts it was concluded that out of 16 messages in the game 1 message were rated as Excellent, 9 messages were rated Good, 6 messages were rated Average, none of the messages were graded as Poor and Very Poor. The suggestions given by the experts were used to revise the messages in the game. The revised messages can be incorporated in the next edition of the game by the game developer. Content analysis of the game gave valuable insights about the choice of language and nature of messages to be included in a game on Tuberculosis for mass distribution in Hindi language.

4. Conclusions and Recommendations

The games AIDS Fighter Pilot and Stop TB Cricket were liked by almost all the youth. The concept of edutainment based games was appreciated by all the youth. Mobile Phone Gaming was an innovative media for presenting highly

serious information by using the challenge and excitement offered by Games and the advantages offered by m-learning technology. Both the games were found to be effective in creating awareness and increasing the knowledge of youth about HIV-AIDS and Tuberculosis.

This media can be used to disseminate development messages to remote and inaccessible regions in a cost and time efficient manner. These games can be used as tools in behavior change communication, creating awareness and giving information on sensitive issues. These games can be used by the gamers within the privacy of their homes as well openly in public places; either alone or with peer group, family members and colleagues at any time at the convenience of the player.

New mobile phone edutainment games should be developed on issues like gender, environment, health, nutrition and on topics from the school syllabus of the youth. Such initiatives can be supported by the local government, NGOs, corporate, especially mobile phone manufacturers and network service providers, and other institutions concerned with development.

Game developers and other organizations involved in the development of such edutainment games should have thorough knowledge of grass root realities and issues to ensure accuracy, adequacy and relevance of content and language. Games should be developed in local languages with superior graphics, sound effects and ease of controlling to enhance the gaming experience. This will help in attracting the young and technology savvy generation. Mobile phone edutainment games should be available on all mobile network service providers. They should allow free download of edutainment games to encourage widespread dissemination of development messages to the masses. AIDS Fighter Pilot should be available in Hindi to reach a larger target population. Some sound effects should be added to this game to give a true rich multimedia experience to the players.

5. Further Implications of the study

Mobile phone edutainment games should be widely publicized through the mass media to inform the public about their purpose, source and method of acquiring. Gaming tournaments can be organized to create interest and awareness amongst the public about these games. Mobile phone edutainment games should be available for free download on all mobile network service providers to facilitate widespread dissemination of development messages to the masses.

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