E-HEALTH: IMPLEMENTATION ISSUES OF HEALTH MANAGEMENT INFORMATION SYSTEM (HMIS) WITH REFERENCE TO SANGLI DISTRICT

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ABSTRACT
Whether it is in the fields of education, health, libraries, entertainment, or even agriculture, information technology is transforming business today. The standard of living for the rural people in India is improving as a result of technological advancements in the fields of agriculture, health, and education. The previous systems of recording and duplication have been improved by information technology, starting a new chapter. The cost has decreased as a result of enormous advancements in data processing, exchange, and management. The newest buzzword, "eHealth," seems to combine industries like healthcare, information, and business. Along the way, it may also result in involved citizens and informed patients. Reviewing the current systems can help find better answers and prepare us for the challenges that lie ahead. Considering the increasing demand in the usage of the Health Management Information System (HMIS) for improving the quality of health services, a need arises in improving the quality and betterment of the system. From the comparative analysis of staff and officers it is observed that there are some implementation issues of e-Health- HMIS.
Keywords: e-Health, Information Technology (IT), Health Management Information System (HMIS), Health Centers, Implementation issues, Healthcare.

Introduction
These days, information technology appears to be the key to all things. The IT boom has saved us by making activities simpler across the board, including in the stock markets, government agencies, schools, and enterprises. The internet can be seen as a lifeline for serious situations and plays a very important part in this. Through Technology, India has advanced significantly. The National Informatics Center (NIC) has successfully introduced PC to every district in the nation, facilitating interactions and communication at the government level. The internet is also useful for communicating information to villages. Rural health, education, and agricultural systems are thriving because of information technology.

The occasional development in automation and computerization of operations over the past two decades has made life easier for many people. The standard of living for the rural people in India is improving as a result of technological advancements in the fields of agriculture, health, and education. Although a computer is just a tool for processing information, the villagers would find it useful to have knowledge about the seasons, agricultural inputs, nearby medical facilities, educational institutions, government programmes, and job openings.

The healthcare industry is a barrier for IT, but it has the potential to do marvels by enabling village paramedic personnel to access the most recent programmes and seek guidance with regard to specializations and illnesses that they are unable to diagnose or treat in rural settings. The internet can aid in raising India's level of health consciousness.

Those who have access to the internet and are knowledgeable about healthcare systems face a significant digital divide, while the other group struggles to meet their fundamental needs. The e-Health concept works best for patients from other countries since it enables them to quickly and easily select healthcare facilities anywhere in the world. The internet is a source for current information, for monitoring epidemics and natural disasters, and

for offering prompt and pertinent resources. Whether it is in the fields of education, health, libraries, entertainment, or even agriculture, information technology is transforming business today.

Objectives of the Study
 The specific objectives of this paper are as under –
    1. To take overview of staff and officers from health centers about Implementing issues of HMIS.
    2. To give suggestions on HMIS Implementation issues based on comparative study of staff and officers.

Hypotheses
    1. Major difficulty in implementing e-Health -HMIS occurs at village level than at Taluka level.
    2. Low literacy level is the main cause for difficulty in implementing HMIS for Best Healthy Village under NRHM in case of small villages.

Methodology Adopted
The methodology adopted is a mixture of literature review, document analysis such as government gazettes, questionnaires and interviews with staff and officers of health centers. The data required for this paper has been collected through a questionnaire. This paper deals with comparative study of officers and staff regarding various implementation issues of Health Management Information System (HMIS) for Best Healthy Village Mission (BHVM) under National Rural Health Mission (NRHM). It also deals with study of different opinions of medical officers (MO) of primary health center (PHC), Taluka Health Officers (THO) and staff of Primary Health Center (PHC) and Sub Center (SC) respectively.

Literature Review
Kelles-Viitanen (2003) The projected result is not achievable unless the efforts of I.T are matched with the development goals affecting the rural poor. Technology only serves as a transformational instrument in the difficult process of eradicating poverty. Better education, employment prospects, access to healthcare, the advancement of democracy, and decent government are the anticipated outcomes. Every level of the economy depends on information sharing, thus any gains there will largely depend on how the rest of the system runs. This is a key component of the thorough method for assessing the impact of ICT. Access to information serves as an important issue. Government has a right to provide access to information of public interest. ICT can serve as a benefactor, by enabling cheap and efficient tools to access information and hence improving social-economic development.

Dutta & Misra (1993) The process of development involves constant resource inputs and ideal results. So, management must use resources as effectively as possible. Here, information technology actively contributes to the meaningful and effective operation of processes. The relationship between inputs and outcomes is still somehow imbalanced in rural areas. The bigger picture of planning and doing things differently affects the overall advancements related to productivity, way of life, health, and literacy level. Good example of Information Technology the author states here is of Andaman & Nicobar. "In Andaman and Nicobar the land owners are given Land Patta Pass Books according to the new management scheme. NIC has also been recently given a task of developing a new system called "Development of Women and Children in Rural Areas". The output after a year of implementation has given encouraging results. The officials across levels in the system are now aware of the power of right information and the development in the process follows."

Sing (2004) A modern Information Technology system of complex processes and high-end outputs for a country where millions of people still strive for basic needs." Albeit, many systems are in pipeline in India as well as other developing countries which demonstrate the benefits to its rural population.

Madon (1992) Information is any data that has been digitally stored, therefore news, entertainment, instructional materials, and announcements are all examples of classified information. Information that is read by one person or many people retains its value after being read, such as a public statement or a weather broadcast.

Paul & Foray (2002) The internet has established its authority in a number of global industries, serving as a practical tool for cross-border trade and economic transactions. But, the rural Indian equivalent could only greatly benefit from receiving information on the most recent agricultural trends, farming equipment, government initiatives, healthcare initiatives, and, above all, job opportunities. Under the influence of IT, the educational sector has also seen tremendous growth. Geographically and socially, the rural sector is mostly insulated from this tsunami.

Bhatnagar & Goyal (1991) Numerous vital initiatives, including family planning and healthcare, are successful in rural areas and are supported by a vast army of volunteers. Given the geographical constraints, these programmes continue to be ineffective. Many of the villages that are assigned to a particular worker are difficult to reach, which makes supervision difficult. As a result, most of the time, proxy records are submitted for failure to handle enormous volumes of data. However, the program's entire budget is extremely constrained, with only a sizable portion going towards paying employees not to consider acting outside of the established course of action.

Bhatnagar & Subhash (1991) Computerization should be implemented cautiously at the field level. The process of scaling up from a small number of successful pilot sites to a large number of sites dispersed geographically is known as large-scale computerization. For those who recognize its value, information technology is a godsend, but for this to happen, every man in the system needs to be trained and retrained. The instruction must be tailored to the requirements of the professional. Monitoring and analysis become simple once specialists are educated and motivated, which promotes openness in the system and better planning and advancement.

NRHM's Common Review Mission (CRM) – (November 2007) The Common Review Mission (CRM) was laid for Mission Steering Group's consent of review and evaluation. The appraisal was conducted in November 2007, 16 months after NRHM got final cabinet approval in July 2006 and the actual processes began. The CRM was offered a task to assess the progress of NHRM on 24 factors relating to core strategies and areas of concern. Hence CRM was endorsed with the task of identifying constraints and simultaneously recommending areas needing reinforcing. The Review Mission was a team of 52 members constituting central and state health government officials and public health experts. After a one-day orientation at the ministry in Delhi, the team divided into 13 groups and left for the selected states: Andhra Pradesh, Assam, Bihar, Chhattisgarh, Orissa, Madhya Pradesh, Gujarat, Jammu and Kashmir, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

District health planning should be enriched to the next level, where the district has sufficient facilities to make its own plans. Budgets allocated should flow according to the plan, where the plan is widely detached and is used as the measure against which outcomes are socially reviewed. States and Districts need the time to learn and improve and an agency or team which acts as an institutional memory of the plans needs to proactively pursue their implementation.

Gupta & Papagari (2004) The information technology approach must be used to address the current health concerns. The internet tool might operate as a trigger by providing different reactions. The Internet could aid in raising public awareness of healthcare and self-care. The Internet has given the government a break by providing a quick means of cost reduction and at the same time efficiency in the delivery of healthcare.

According to the World Bank report "Better Health Systems for India's Poor", India is in the midst of a "health evolution" - the evolution is demographic and social. The major ailments still prevalent in the majority of the population is, preventable infections, pregnancy, childbirth related complications, and malnutrition."

Majority of the Indian population spends on curative care and not on preventive care. This could be due to lack of awareness or being ill-informed. The thriving challenges are fighting the HIV/AIDS epidemic and public health priorities like smoking and mental illness.

Communication technology and information can play a major role in the healthcare industry and a developed economy, creating awareness by sharing information on transmissible diseases like AIDS & TB. Controlling lifestyle disorders like heart ailments and diabetes. Mandatory awareness on vaccination, nutrition and sanitation can help improve overall health issues.

Bodaval & Takemi (2009) India, as compared to other developing nations, spends slightly higher amounts in the health sector. The Indian health care system covers a population of as good as 1000 million residing at 6, 00,000 villages. An exhaustive healthcare system supporting such a huge population would certainly demand whooping investments. Statistics reveal, "India spends 6% of the GDP or $13 per capita in the health sector." In spite of such approaches, many key health indicators are very low, communicable diseases, maternal mortality and morbidity especially among the poor seems high and these indicators vary from region to region

The Health Management system is in charge of carefully examining numerous elements, including drug inventories, equipment status and availability, staff, and associated costs. This aspect needs to be regularly evaluated. It is necessary to have up-to-date, correct information to better service delivery. Data recording,

retrieval, and storage are provided by the HIS. The availability of this data at the federal, state, and institutional levels makes it easier to plan, arrange, and manage healthcare facilities.

Data Analysis
This section deals with present office automation status, availability of trained staff to operate computers, facilities available at health centers to implement HMIS, current evaluation system of health indicators in selected health centers like SC, PHC, THO etc.

There were 27 staff from PHC and 21 officers who responded to this question. The frequency distribution and percentage regarding facilities available at health centers and offices is given in the table below.

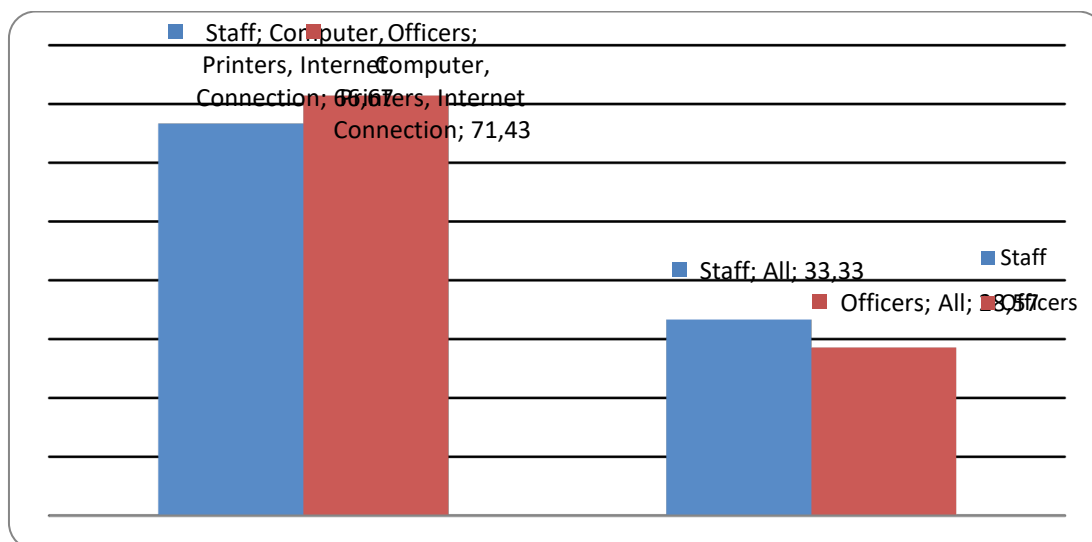| Facilities available at health center / office	Staff		Officers		Total	
	Count	%	Count	%	Count	%
Computer, Printers, Internet Connection	18	66.67	15	71.43	33	68.75
All including data entry operator	9	33.33	6	28.57	15	31.25
Total	27	100	21	100	48	100.00

Table 1: Facilities available at health center/office

Figure 1: Facilities available at health center/office

H_0: Equal facilities are available at both the levels.
H_a: There is a significant difference in the available facilities at both levels.

	Value	df	p-value
Pearson Chi-Square	0.125	1	0.362
N of Valid Cases	48		

Table 2: Test statistics - Facilities available at health center/office

Interpretations: The calculated Chi-square value (0.125) is less than its table value (5.04) and p-value > 0.025 at 5% level of significance. Hence it provides sufficient evidence to accept the null hypothesis and conclude that there is no significant difference between the opinion of officers and staff for the availability of facilities.

From table 1 and Figure 1 it is clear that 18 (66.67%) staff and 15 (71.43%) officers from PHC, THO & DHO etc. have all the facilities like computers, printers, internet connection to implement HMIS. Here only staff & officers of all health centers excluding sub centers responded to this question because sub centers have no such facilities available. From oral discussion with officers and staff it is understood that data entry operator is available at only THO & DHO. So, it is inferred that computer and other supporting facilities are available only at PHC, THO & DHO.

Availability of local technical support in case of problems:
The current table shows comparative analysis of opinion given by staff and officers regarding availability of local technical support at their health centers.

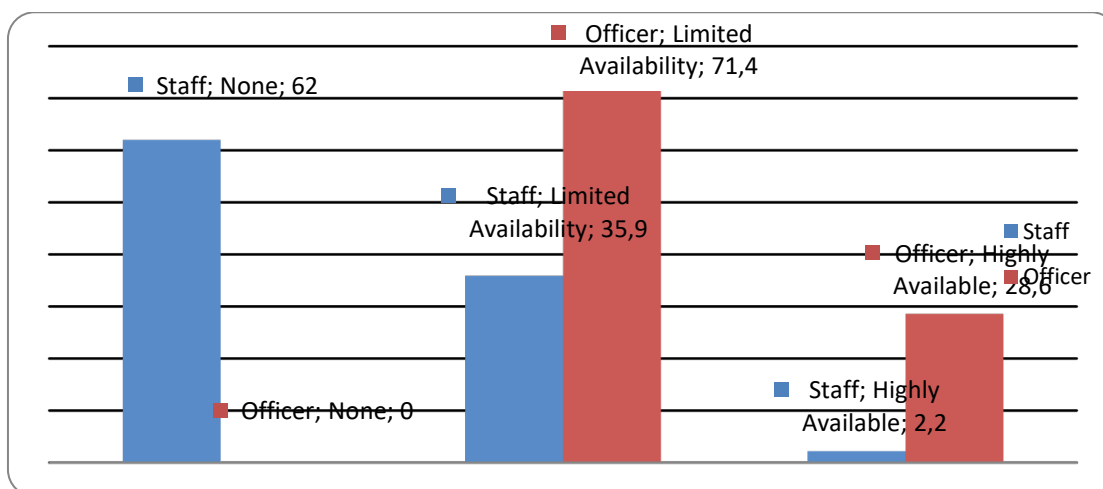| Availability of local technical support	Staff		Officers		Total	
	Count	%	Count	%	Count	%
None	57	62.0	0	.0	57	50.44
Limited Availability	33	35.9	15	71.4	48	42.48
Highly Available	2	2.2	6	28.6	8	7.08
Total	92	100.0	21	100.0	113	100.00

Table 3: Availability of lo`cal technical support

Figure 2: Availability of local technical support

H_0: At both the levels the respondent agrees that local technical support staff is available at the time of problem.
H_a: At both the levels the respondent do not agree that local technical support staff is available at the time of problem.

	Value	df	p-value
Pearson Chi-Square	34.929	2	0.000
N of Valid Cases	113		

Table 4: Test statistics - availability of local technical support

Interpretations: The calculated Chi-square value (34.929) is greater than its table value (7.38) and p-value < 0.025 at 5% level of significance. Hence it provides sufficient evidence to reject the null hypothesis and conclude that there is no agreement at local level staff and officers level staff for the availability of technical staff for solving the problems.

The table 4 and Figure 2 indicates that there is limited availability of local technical support in case of problem, 15 (71.4%) officers agreeing to this and that no technical support is available at SC and PHC, 57 (62%) staff is agreeing to this. So it is inferred that there is limited availability of local technical support at health centers.

Difficulty in implementation of HMIS at Village level
The study for the difficulty of implementation at the village and Taluka level is studied by considering all the respondents and thereafter by checking the difference in opinion, designation-wise i.e. at local staff and officer level.

Difficulty in implementation of HMIS at Village level – All respondents
The current table shows frequency distribution and percentage of opinion given by all respondents i.e. staff and officers collectively regarding difficulty in implementation at village level than that of Taluka level.

Difficulty in implementation of HMIS occurs at Village level than that of Taluka level	Respondent Count	%
Strongly Agree	28	24.8
Agree	73	64.6
Disagree	11	9.7
Strongly Disagree	1	.9
Neutral	0	.0
Total	113	100.0

Table 5: Difficulty in implementation of HMIS at Village level
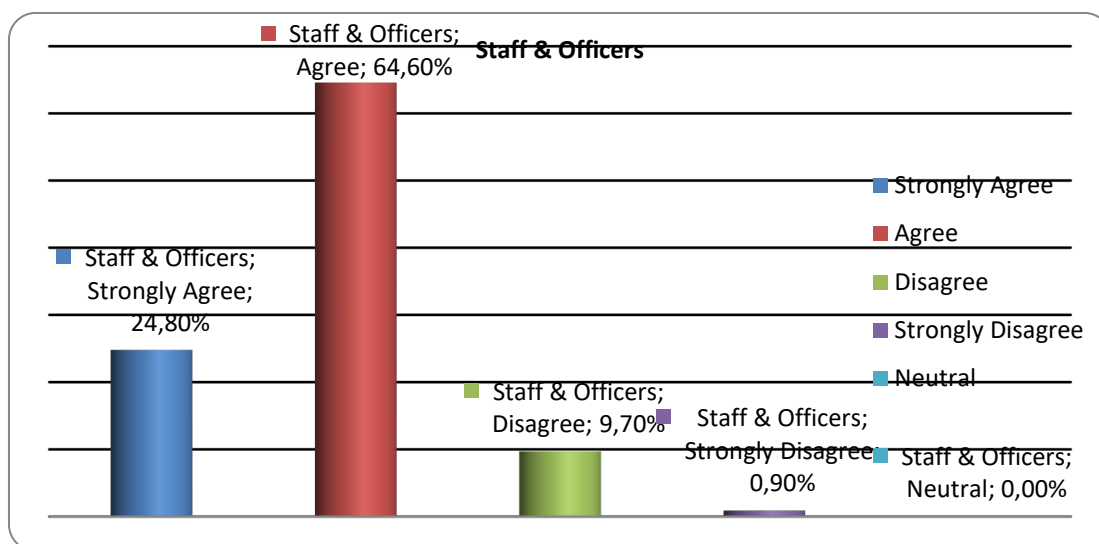

Figure 3: Difficulty in implementation of HMIS at Village level

Interpretations: From Table 5 and Figure 3 it is inferred that it is more difficult to implement HMIS at village level than that of Taluka level as 24.80% respondent strongly agree and 64.60% respondent agree with this.

H_0: The proportions of respondents who agree and don't agree are almost 50% and equal to the opinion that the implementation of HMIS is more difficult at village level than at Taluka level.
H_a: The proportions of respondents who agree are significantly more than those who don't agree that the implementation of HMIS is more difficult at village level than at Taluka level.

The following table shows the test statistics of Z- test for the opinion that the implementation of HMIS is more difficult at village level than at Taluka level, by considering level of significance 5%.

Sample proportion	0.89
95% CI (asymptotic)	0.8416 - 0.9384
z-value (calculated)	8.3
z-value (table) one tailed	1.645
P-value	<0.0001

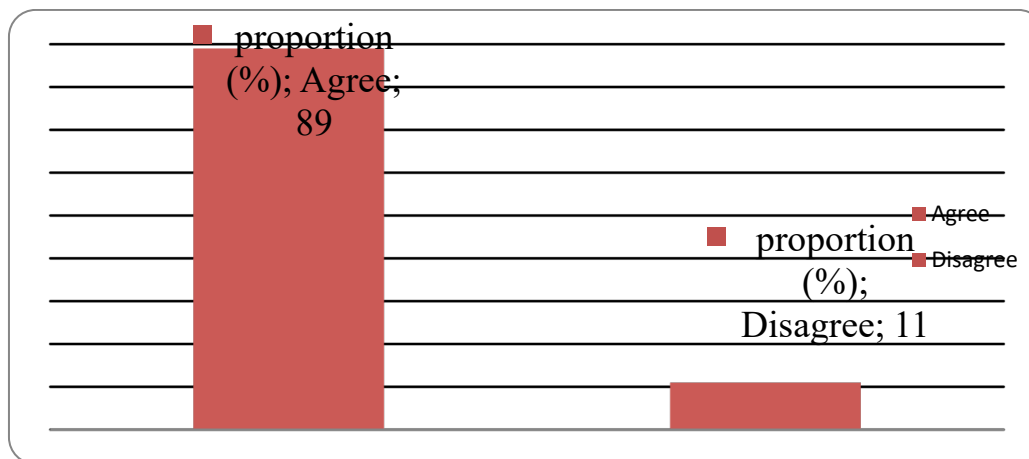Table 6: Test statistics of Z- test - HMIS at Village level

Figure 4: Implementation of HMIS at Village level – Z test

Interpretations: The calculated z- value (8.3) is greater than its table value (1.645) and p-value < 0.05 at 5% level of significance. Hence it provides sufficient evidence to reject the null hypothesis and conclude that the proportions of respondents those who agree (89%) are significantly more than 50% and hence more than those who don't agree (11%) to the opinion that the implementation of HMIS is more difficult at village level than at Taluka level. It shows that when overall (all respondents) opinion is considered the implementation of HMIS is more difficult at village level than that of Taluka level. Researchers tried to check the opinion difference for the staff and officers level. Table 6 and Figure 4 indicates that 89% respondent agree that there is difficulty in implementation of HMIS at village level than that of Taluka level.

Difficulty in implementation of HMIS at Village level – Designation wise:
The current table shows frequency distribution and percentage of opinion given by all respondents i.e. staff and officers separately regarding difficulty in implementation at village level than that of Taluka level.

HMIS implementation is difficult at village level than that Taluka level	Staff		Officers		Total	
	Count	%	Count	%	Count	%
Strongly Agree	24	26.1	4	19.0	28	24.78
Agree	61	66.3	12	57.1	73	64.60
Disagree	6	6.5	5	23.8	11	9.73
Strongly Disagree	1	1.1	0	.0	1	0.88
Neutral	0	.0	0	.0	0	0.00
Total	92	100.0	21	100.0	113	100.00

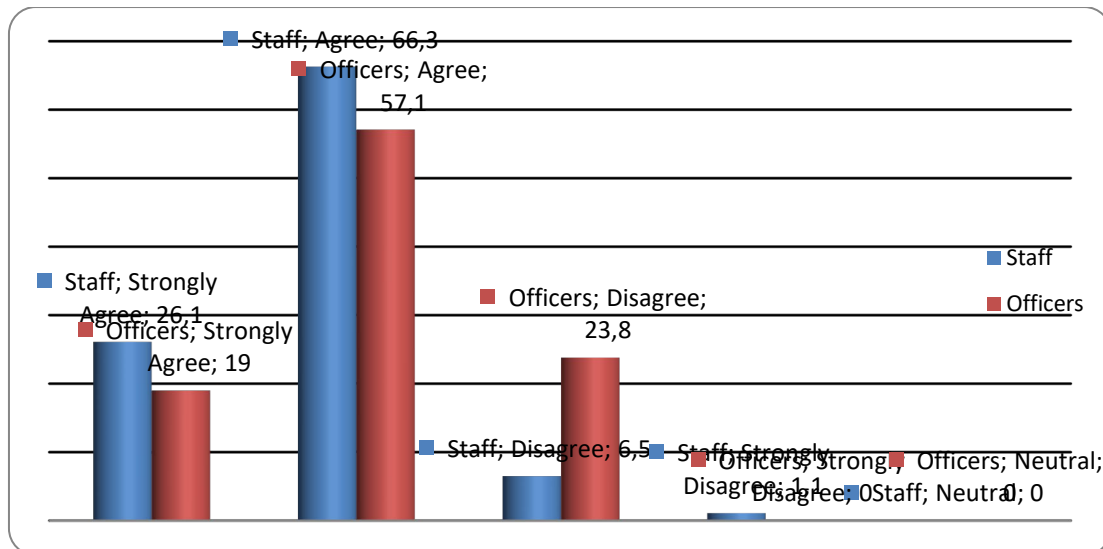Table 7: Difficulty in implementation of HMIS – Designation wise

Figure 5: Difficulty in implementation of HMIS – designation wise

H₀: Staff and officers agree that the HMIS implementation is more difficult at village level than that at Taluka level.

Hₐ: Staff and officers do not agree that the HMIS implementation is more difficult at village level than that at Taluka level.

	Value	df	p-value
Pearson Chi-Square	6.042	3	0.064
N of Valid Cases	113		

Table 8: Test statistics - difficulty in implementation of HMIS at village level

Interpretations: The calculated Chi-square value (6.042) is less than its table value (9.35) and p-value > 0.025 at 5% level of significance. Hence it provides sufficient evidence to accept the null hypothesis and conclude that all the respondents irrespective of their designation staff and officers agree that the implementation of HMIS is more difficult at village level than that at Taluka level.

From table 8 and Figure 5 it is clear that 66.3% staff and 57.1% officers agree with the difficulty of implementation of HMIS at village. So it can be inferred that it is more difficult to implement HMIS at village level than Taluka level because facilities available at Taluka are not available at village level.

Low literacy level is the difficulty in implementing HMIS:
The study for the difficulty of implementation of HMIS in case of small villages due to low literacy level is studied by considering all the respondents and thereafter by checking the difference in opinion designation wise i.e. at local staff and officers level.

Low literacy level is the difficulty in implementing HMIS – All respondents:
The present table shows frequency distribution and percentage of opinion given by all respondents i.e. staff and officers collectively regarding difficulty in implementation of HMIS in case of small villages due to low literacy level.

ow literacy level is the main cause for difficulty in implementing HMIS in case of small villages	Count	%
Strongly Agree	4	3.5%
Agree	66	58.4%
Disagree	42	37.2%

Strongly Disagree	0	.0%
Neutral	1	.9%
Total	113	100.0%

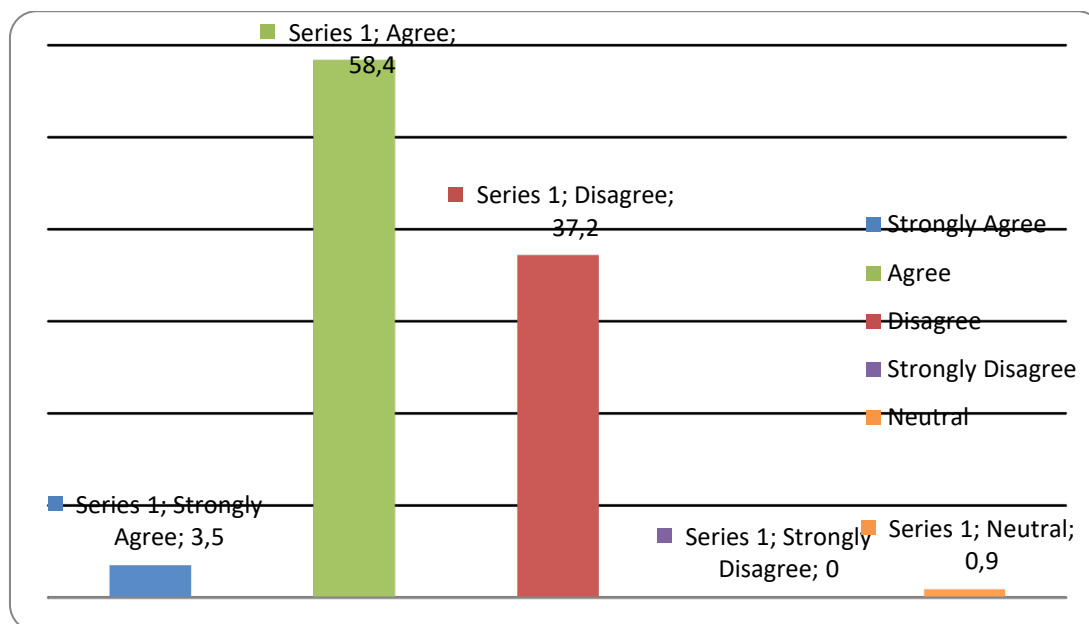Table 9: Low literacy level is the difficulty in implementing HMIS

Figure 6: Low literacy level is the difficulty in implementation of HMIS

Interpretations: From table 9 and Figure 6 it is inferred that low literacy level is the main difficulty in implementing HMIS in case of small villages as 58.4% respondent agree with this.

H₀: The proportions of respondents who agree and don't agree are almost 50% and equal to the opinion that the low literacy level is the main cause for difficulty in implementing HMIS in case of small villages.

Hₐ: The proportions of respondents who agree are significantly more than those who don't agree that the low literacy level is the main cause for difficulty in implementing HMIS in case of small villages.

The following table shows the test statistics of Z- test for the opinion that the low literacy level is the main cause of difficulty in implementation of HMIS in case of small villages. Here 5% level of significance is considered.

Sample proportion	0.62
95% CI (asymptotic)	0.5449 - 0.6951
z-value (calculated)	2.6
z-value (table) one tailed	1.645
P-value	0.0054< 0.05

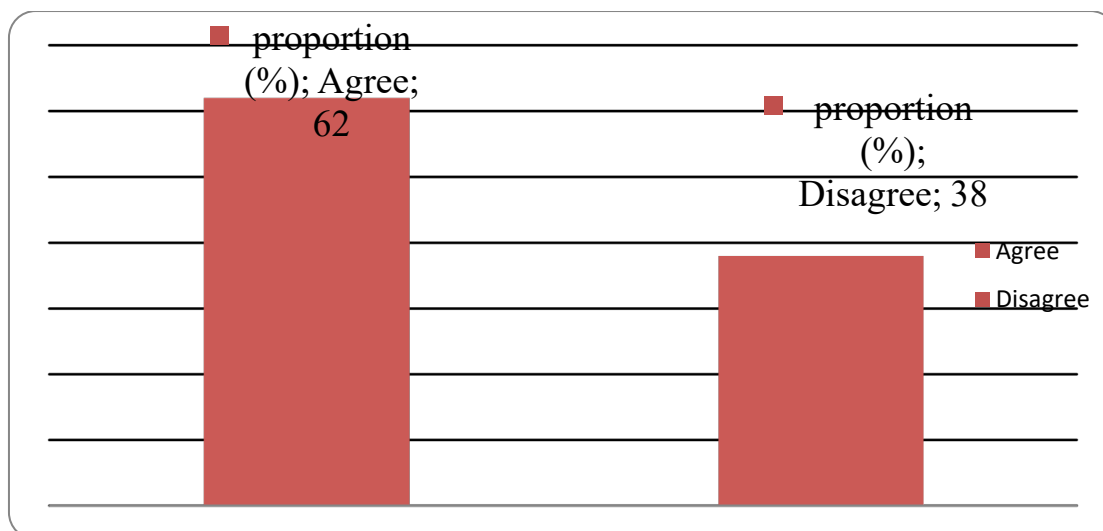Table 10: Test statistics of Z - test – Low literacy level

Figure 7: Low literacy level – Z test

Interpretations: The calculated z- value (2.6) is greater than its table value (1.645) and p-value < 0.05 at 5% level of significance. Hence it provides sufficient evidence to reject the null hypothesis and conclude that the proportions of respondents those who agree (62%) are significantly more than 50% hence more than those who don't agree (38%) on the opinion that the low literacy level is the main cause for difficulty in implementing HMIS in case of small villages.

The table 10 and Figure 7 indicate that 70(62%) respondents agree that there is difficulty in implementation of HMIS in case of small villages due to low literacy level. Researchers tried to check the opinion difference for the staff and officer's level separately i.e. investigated this at designation level as given below.

Findings for Implementation issues of HMIS from the comparative study of officers and staff:
This section deals with the observations and findings for present office automation status of health units like SC, PHC, THO, DHO etc. of Sangli district, availability of trained staff to operate computers, facilities available at health units to implement HMIS, current evaluation system of health indicators in selected health units and implementation issues of HMIS.

1. The present study reveals that 82.4% staff and officers from PHC, 91.7% staff and officers from THO are using manual as well as computerized mode for office automation, but 89.2% staff of SC are preparing reports manually. During the visit of researcher at health units and oral discussion of researcher with staff it is found that there is no computer facility available at SC, it is available at only PHC, THO and DHO. So here is the major issue to implement HMIS at SC/Village level because of lack of facilities.
2. It is observed there is no such HMIS for Best Healthy Village Mission implemented in health centers. So there was a scope to design the HMIS for BHVM by taking some inputs from staff and officers for the same and accordingly researchers have developed HMIS model for BHVM which is having a social advantage also.
3. It is found that there is no availability of trained staff to operate computers at their health units as per the majority of staff [52.2%] has given this opinion. But 85.7% officer's opinion is positive about the trained staff to operate computers. From oral discussion of researcher with staff and officers it is observed that computer facility is only available at PHC, THO and DHO, so there is some trained staff is available to operate computers but the computer facility is not available at sub centers, so there is less trained staff available to operate computers at their health units.
4. It is revealed by the study that only 66.67% staff and 71.43% officers from PHC, THO and DHO etc. use all the facilities like computers, printers, internet connection etc. Here only staff and officers of all health centers excluding sub centers availing these facilities because sub centers have no such facilities available. From oral discussion of researchers with officers and staff it is found that data entry operators are available at only THO and DHO. So it is inferred that computer and other supporting facilities for implementation of HMIS are available only at PHC, THO and DHO.
5. During the study it is found that there is limited availability of local technical support in case of problem as majority of officers [71.4%] agree with this and no technical support is available at SC and

PHC as 62% staff agree with this. So, limited availability of local technical support at health centers is one of the implementation issues for implementation of HMIS.

6. It is revealed from the study that it is more difficult to implement HMIS at village level than that of Taluka level as 24.80% respondents strongly agree and 64.60% respondent agree with this. This difficulty of implementation at the village is found by considering all the respondents and thereafter by checking the difference in opinion designation wise i.e. local staff and officers level. 8 It is found that 66.3% staff and 57.1% officers agree with the difficulty of implementation of HMIS at village level. Thus it is concluded that, the proportions of respondents who agree are significantly more than those who don't agree that the implementation of HMIS is more difficult at village level than at Taluka level. It is observed from study that due to lack of facilities like computers, internet connections, trained staff for operating computers and availability of technical support at village level is the main difficulty to implement HMIS at village level.

7. It is found from the study that that low literacy level is the main difficulty in implementing HMIS in case of small villages as majority of respondents [58.4%] i.e. staff and officers of health units agree with this. Researcher has checked the opinion difference for the staff and officers level separately i.e. investigated this at designation level for the difficulty of implementing HMIS due to literacy level. It is observed that 62% staff and 42.9% officers agree with the difficulty of implementation of HMIS in case of small villages. Here there is a higher percentage of staff as compared to officers who are thinking low literacy level in small villages is the main cause of difficulty in implementing HMIS.

Conclusion

It is concluded from the study that computers and other supporting facilities for implementation of HMIS are available only at PHC, THO and DHO. So it is a major implementation issue for implementation of HMIS at SC level. It is found that there is less availability of trained staff to operate computers as well as there is limited availability of local technical support in case of problems. It is revealed from the study that it is more difficult to implement HMIS at village level than that of Taluka level and low literacy level is the main difficulty in implementing HMIS in case of small villages. The user education in the use of information for management and meeting user needs are also fundamental problems which affect use of HMIS.

It is also concluded that the computer and internet facility along with trained staff to operate computers should be provided to every health center as well as there is need to increase the availability of local technical support for effective implementation of HMIS. There is a need to promote the awareness of health and health services provided by the government as well as there is a need to increase the level of literacy among the peoples of rural areas specially in case of small villages for better implementation of HMIS. The user education for the use of information, involvement of key personal and management support are important for implementation of HMIS.

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