Access to Safe Drinking Water: Effects on Health and Time Management in Andhra Pradesh, India

by

Dr.G. Rama Rao[1], Dr. (Mrs) G. Rohini Devi[2] & MNV Prasad[3]

Introduction:

The most precious resource of any nation is a healthy population. Health, however, is impossible to achieve without adequate water supplies, safe drinking water and basic sanitation. Providing safe drinking water is an integral part of primary health care and essential if health for all by the year 2000 (HFA/2000) is to become a reality.

All countries have pledged their support for this goal, but the challenge is daunting. In 1977, when countries resolved to give priority to water and sanitation for the poor and less privileged the target group numbered nearly 2,000 million people. Again in 1980, estimates showed that in developing countries only 29% of people in rural areas and 75% in urban areas have access to safe drinking water. Only 13% of rural and 53% of urban peoples were covered by sanitation schemes. If urban growth accelerates as predicted, with increasing and worsening slum conditions, an even larger proportion of urban areas will be without safe drinking water and sanitation.

Safe drinking water is vital for human health and efficiency. More than one billion people in the world lack access to an adequate supply of safe water for household use. Part of the problem is contaminated and growing water scarcity, which makes it difficult to meet increasing demands. Diarrhoea caused by unsafe drinking water is among the World's greatest killer contributing to deaths of 3 million children annually and also causing about 900 million episodes of illness each year. At any one time more than 900 million are affected with Roundworm infection and 200 million with Schistosmasis. Recent studies indicated, diarrhoea death rates are 60 percent higher among those with out such facilities. Improved access to safe water yields

[1] Professor &Head Deptt. Mathematical Demography & Statistics, IIPS. Deonar Mumbai-88
[2] Head Department of Sociology, SK Somaiya College of Arts, Commerce &Science, Mumbai - 77
[3] Research Officer, IIPS, Deonar, Mumbai-88

direct economic benefits. In many rural areas, obtaining drinking water is time consuming, heavy work, taking up 15 percent of women's time.

Importance of providing safe drinking water was fully recognized in Fifth Five Year Plan and included in Minimum Need Programme. In 1986, the National Drinking Water Mission was launched in order to provide scientific and cost effective content to the centrally sponsored Accelerated Rural Water Supply Programme. The main motto of this Programme is to provide water free from fluoride and Iron contamination. About 850 villages in Andhra Pradesh have been identified to have Fluoride contamination of drinking water, Anantapur district is one such area. It is estimated that around 40 percent rural population of India in 1991 is not receiving safe drinking water. Sri Sathya Sai Baba Central Trust, a public charitable trust had undertaken a major infrastructure project namely Sri Sathya Sai Water Supply Project for the first time in the world. But to reach the people in more than one lack villages require huge capital. It is also quite necessary to assess utilization problem and benefits incurred to the household in supply of drinking water. Keeping this in view, an attempt has been made to examine the extent of direct and indirect effects of time management and also impact on health.

Sri Sathya Sai Water Supply Project:

Sri Sathya Sai Baba Central Trust launched in Andhra Pradesh in 1994. Sri Sathya Sai water Supply Project (SSSWSP) covering about 731 villages in Anantapur district. It covers urban centers such as Anantapur, Kadiri, Dharmavaram to provide safe drinking water to a million people, who had lived all their lives on the edge of drought and despair. Sri Sathya Sai Water Supply Project is a collaborative effort of Sri Sathya Sai Baba Central Trust, the Government of Andhra Pradesh and Larsen & Toubro Limited-ECC Construction Group. The uniqueness of the project is completed within a year because of deep sense of urgency. Approximately US$ 70,000,000 was spent.

Sri Sathya Sai water Supply Project consists of four schemes:

1. Comprehensive Protected Water Supply schemes (CPWS) involve infiltration wells, collection wells and associated pumping behind the Chitravati Balancing Reservoir at Peddakotla and Chinakotla. Sources for infiltration wells includes Pennar and Hagari reviers.

2. Direct pumping from Pennahobilam Balancing Reservoir and treatment through rapid sand filtration system.
3. Comprehensive Water Supply scheme (CWS), through seven summer storage tanks ranging up to 100 acres by tapping water from Tungabhadra High Level Canal, when water flows in the canal.
4. The Pretected Water Supply scheme (PWS) covers 290 villages. It involves drilling deep bore wells, construction of storage tanks and installation of pipeline networks.

Method & Materials:

Study Area:

1. Anantapur district, one of the four districts of Rayalaseema region, Andhra Pradesh, India.
2. It is declared as a drought prone area, having low rainfall and temperature above 45 centigrade in summer. There is an acute shortage of safe drinking water in summer season.

Sampling Design:

Sri Sathya Sai Water Supply Project covered 731 villages. Out of these, 15 villages were selected by Simple Random Sampling (SP villages). Seven adjacent but identical (NSP villages) (having the same socio-economic characteristics), which were not covered under the same scheme were also selected for the purpose of comparison. From each selected village 50 households were selected by Systematic Circular Sampling. Altogether 1105 households were selected. The structured questionnaires were canvassed to collect detailed information relating a household, particularly water sources and utilization, morbidity in the household individuals. In addition to it, the opinion of community leader's were not taken. The functioning and utilization of SSSWSP schemes, and from medical officers the perception of morbidity pattern. The investigators were trained to minute observations in detail regarding the opinion and problems in utilization of Rural water Supply (RWS) schemes as well as SSSWSP schemes. The survey conducted during the year 1999-2000.

Tools:

Standardized age incidence rates are computed for both SP and NSP villages by taking The age distribution of Andhra Pradesh as the standard population.

Objectives:

The main objectives of this paper are:

1. To evaluate direct and indirect effects of time save management before and after the implementation of the Sri Sathya Sai water Supply Project.
2. To examine the changes in morbidity pattern in particular reference to waterborne and fluoride related diseases in the households of Not Covered and Covered villages under Sri Sathya Water Supply Project.

It is evident from the Table 1 that the distribution of background characteristics of the respondents such as religion, caste, age education and occupation are more or less same between the SP and NSP villages. The median age of the respondents for the two groups of villages is around 45 years. The predominant caste in both SP and NSP villages to other backward caste followed by scheduled caste. Half of the respondents in both villages are illiterate and are working as labourers. The average of household size in both SP and NSP villages are around 5.5. This clearly indicates that here is hardly any difference between SP and NSP villages as regards to demographic socio-economic and housing conditions are considered.

The main sources of water supply for drinking, washing, and taking bath and for other domestic purposes are being compared in this study between SP and NSP villages. This would give a clear picture whether there exists any difference between these two groups of villlages. It is observed that prior to installation of the scheme two thirds of the households in both SP and NSP villages used to depend entirely on public hand pumps for their drinking, washing, taking bath and other domestic purpose.

In addition to it in both the SP and Non SP villages[**] used to depend upon public taps laid down by rural water supply department. This clearly shows that the SP and NSP villages used to depend on public hand pumps and public taps before the installation of SSPS project .

It is interesting to note that there are notable changes in the SP villages after implementation of SSP. It is heartening to note that 9 out of 10 households who used to draw

[**] One fourth of the households

water from public hand pumps prior to the implementation of the scheme have now shifted to public taps laid down by SSWP. Similar trend was observed by those households, who draw water from RWS public taps. On the whole, around 85 percent of the households in SP villages have shifted from their earlier water sources – The number of households that are continuing with the prior sources of water has reduced to a great extent. The possible reasons for the shift mentioned by the respondents were (a) reduction in the distance travelled from the source of water from their residence. (b) reduction in the time spent to fetch water from their residence (c) continuous and regular flow of water supply.

Distance: Prior to the implementation of the scheme, respondent used to walk around 100 to 120 meters from their residence in both the SP and non SP villages. The planner of SSPS, in order to bring benefit to maximum number of people, laid the public taps where the houses are clustered. Thus the travel distance was minimized to 50 meters. After the implementation of SSPS project it is heartening to note that this distance has been reduced to 50 meters. At the same time it is hurting to know that the NSP villagers are still travelling a median distance of 100 meters to collect water.

Time: Another important factor mentioned by the respondents to shift to public taps was reduction in time for fetching water. Prior to the implementation of the scheme, around 25 percent of the villages used to spend more than half an hour to fetch water. But interestingly after the SSPS implementation, they are able to get water in ten minutes. But unfortunately even now, in the NSP villages, people are spending half an hour for fetching water.

Before SSPS project both the groups of villages used to spend on an average 32 and 28 minutes for fetching water. But after SSPS in the SP villages, this percentage is drastically reduced to 16 minutes. This clearly shows that SSPS project definitely helped the people in the SP villages by reducing the distance travelled from their residence and the time spent for fetching water.

As already mentioned before, 15 percent of the people are still depending on public hand pumps for their main source of water. when questioned for the continuation of the same source even after the implementation of SSPS, the respondent were mentioning that the water from SSPS is salty, muddy, and giving chlorine smell(taste). That is why they are still continuing

their previous sources as they are used to that taste. But at the same time they mentioned that for the domestic purpose they are using the SSPS project water. As some village people are very rigid about their food and drinking water habits they want to continue the same drinking water without shifting.

Regular flow of water: In the urban and even in rural areas due to shortage of water only few hours are allotted to collect the water from the public taps. It is heartening to note that 90 percent of the SP villages respondents are receiving water regularly where as only 62 percent of the respondents the NSP villages are receiving regularly. In the NSP villages 30 percent respondents are depending upon the mercy of the electricity (power) for their regular supply of water, where as the corresponding percentage for the SP village is only 7. This clearly indicates that SP villages are enjoying the regular water supply compared to NSP villages. Usually sufficient water is available in winter and in rainy seasons. The situation worsens in summer, but the SP respondents never felt the dearth of water even in summer also.

Around 80 percent of the households are receiving sufficient water in the summer also in the SP villages while in the NSP villages around 25 percent of the respondents only receiving this benefit. In the drought prone area like Ananthpur district special efforts have to be made to procure water in summer season. Around 86 percent of the respondents in the NSP covered villages complained that they have to make extra efforts to fetch water in summer and this percentage has reduced to 30 percent in the SP villages.

The main advantages achieved to household members in SP villages due to implementation of the scheme are (1) reduction in distance travelled to fetch water from source to residence (2) considerable time saved in fetching water due to reduction of distance and (3) regularity of water supply particularly in summer season.

Impact of water on social attitudes and hygiene habits

In the earlier section how SP villages respondents are benefited by travelling less distance for water, how they saved their time while collecting the water were discussed.

The links between water and health are complex, influenced by a series of interacting factors and heavily dependent on social attitude and hygiene habits. In this section an attempt

has been made to study the changes in social attitude, hygiene habits due to availability of abundant water.

Around 56 percent of the respondents in SP villages have informed they have saved lots of time. The respondents have informed that male members are going to their fields earlier than before and female members are doing extra works in their households which they never used to do prior to the scheme. It is pertinent to observe that the house wives used to take major responsibility in collecting water from two various services for drinking bathing and other domestic purposes in SP and NSP villages prior to implementation of the scheme.

Prior to the implementation of the project as it is already mentioned most of the women and men were only involved in the collection of water. The participation of children in this activity was less as it is very difficult for the children to carry water from long distances.

SP has made the task easier by installing the public taps very nearer to their residences. Thus there is a significant shift from the elders to the children in the collection of water. Prior to the SSPS project, 75 percent of women and 17 percent men were involved in the collection of water. Only 8 percent of children used to collect water prior to the project. This percentage is increased to 55 after the implementation*.

Prior to the scheme, sixty six percent of women in SP villages have reported that they suffered with severe body pain or getting tired as they used to carry heavy pots on their shoulders whereas now this percentage has reduced drastically to half. In NSP villages, 94 percent of the women mentioned that they are suffering either body pain or getting tired. The possible reasons for reduction in body pains among women may be a) Shift in the collection of water from women to children b) Distance travelled and time spent to fetch water became less now
There is a significant reduction for the persons to stand in long ques for water in SP villages after the implementation of the scheme whereas even now in the NSP villages the persons have to wait more time and stand in long ques for water.

In the villages there used to be frequent quarrels for water particularly when it is scare. Fifty two percent of the respondents informed that there used to be frequent quarrels in SP villages prior to the scheme and their fights have reduced after installation. It is pertinent to note that two third of the respondents reported that frequent quarrels are occurring even now in NSP villages for water.

* In the NSP villages 22 percent of children are engaged in collection of water

It heartening to note that not only quarrels for water have reduced in the SP villages but also a higher proportion of respondents are exchanging water among themselves now which was not existent prior to implementation of the scheme. This attitude of exchanging water is almost absent in NSP villages even now.

It is pertinent to note that the consumption of water has increased considerably in SP villages after the implementation of the scheme. The average number of pots collected in SP and NSP villages prior to the scheme are 10 and 12 respectively. The average number of pots collected in SP villages has increased to 22 now.

The increase in the consumption of water after implementation of the scheme has made a great significant change in bathing pattern among the household members in the SP villages. Half of the household members in the SP villages are taking bath daily after the scheme has been installed whereas prior to the scheme only one fourth of them used to take bath, prior to the implementation of the scheme around, 30 percent of them used to take bath every alternative day whereas very few members are taking bath on alternative days after the implementation of the scheme. There is hardly any difference noticed in bathing pattern between the NSP villages and SP villages before the scheme. This clearly indicates the impact of scheme on bathing pattern.

To sum up, the SP project has helped the people in the following manner.

A. Male members are going early to their work

B Children are able to help the family by drawing water from the public taps

C. Women now are able to well use their time in other activities.

D. Women are greatly relieved from body pains and tiresomeness.

E. Fights for collection of water were reduced

F. People are helping each other incase if any one needs extra water.

G. The respondents are able to take bath every day as there is no shortage of water.

Safe drinking water and health

Today, water supply and sanitation related diseases emerge as the largest group of diseases in AP state influenced by environmental causes. In fact, these diseases are responsible for 60% of the environmental health burden and 11% of the total burden in the state.

Diarrhoea is most closely associated with water supply and sanitation. Nearly 3,71,11,500 new cases of diarrhoea among children aged 0 to 4 years happen in Andhra Pradesh

annually. This results in an estimated 49,000 deaths per year, outbreaks of cholera, dysentery, typhoid, hepatitis and E.coli are attributed to the exposure to water borne pathogens.

Information whether any member in the respondent's house suffered with any type of sickness during the past three months also been collected to in order to find out the relation between safe drinking water and health.

In depth enquiry about the symptoms of the sickness was conducted wherever the respondents replied positively to the sickness.

The ratio of prevalence sickness in the SP and NSP villages counts to be 159, 231. This clearly proves that safe drinking water plays an important role on health. Both in SP and NSP villages few villages are having flourosis. In water contaminated. In the SP flourosis villages, water is brought from a long distance where the water is not affected with flourosis. As the safe drinking water is provided to them, the prevalence of arthritis has come down drastically whereas in NSP villages the respondents are taking contaminated water. so still the persons are suffering with arthritis.

The prevalence of sickness has also been analyzed by age wise. The age specific prevalence rates for both SP and NSP villages showed I shaped curve with a minimum prevalence rate in the age group 5-9 years* and maximum in the age group 60 years above.
and maximum in the age group 60 years and above. Irrespective of the age groups, the prevalence rates in NSP village is more as compared to SP villages. the gap in the prevalence rates between the villages is particularly more the age group 50-59 and 60 years and above.

Irrespective of the levels of education, the prevalence rates in NSP villages are significantly high as compared to SP villages.

Among the diseases prevalent in SP villages, the seasonal diseases such as cough/cold, high fever and malaria ranked first with the prevalence rate of 77 followed by Arthritis with 29. On the other hand, Arthritis ranked first in NSP villages with 91 followed in seasonal diseases with a prevalence rate of 65. It is hurting to observe that the prevalence rates of all the specific diseases are reported to be high in the NSP villages as compared to SP villages with an exception of seasonal diseases.

* The prevalence rate is calculated as the number of persons suffering with any type of sickness during the past three months per thousand population. The specific disease prevalence rate is calculated as the number of persons suffering with specific disease per 1000 population.

The prevalence rates referred earlier are crude as they are affected by age distribution. So we cannot and strictly say that NSP villages are having higher prevalence than that of SP villages. The standardized prevalence rates are computed by taking Andhra Pradesh age distribution as a standard population. A significant reduction is observed in crude and standardized prevalence rates in SP villages (CPK 159 & SPR 232) These findings clearly indicate that the access of safe drinking water to SP villages has resulted a significant improvement in their health conditions as compared to their adjacent NSP villages.

To sum up it has been observed that,

1. Number of people suffering with sickness in the past 3 months was more in NSP compared to SP villages
2. An inverse relationship between is observed between the levels of education and prevalence rate in both SP and NSP villages.
3. Water borne diseases reduced in SP than NSP
4. Number of people suffering from or Arthritis is less in SP than NSP

Thus there is a significant improvement in their health in SP villages due to the safe drinking water.

Table1. Percent distribution of heads of households according to background characteristics in SP and NSP villages

	NSP villages	SP villages
Sex of household head		
Male	93.9	95.3
Female	6.1	4.7
Age of household head		
<30	12.2	13.3
30-44	28.3	29.4
45-59	43.9	35.8
60+	15.6	21.5
Median age	45.0	45.0
Religion		
Hindu	97.8	95.2
Muslim	1.9	4.7
Christian	0.3	0.1
Caste		
Scheduled Caste	21.1	16.8
Scheduled Tribe	3.6	4.7
Other Backward Class	72.2	71.0
Other Caste	3.1	7.5
Education		
Illiterates	58.9	55.6
Literate, middle completed	30.8	32.9
Metric and above	10.3	11.5
Occupation		
Labourers	55.8	50.0
Landlords	27.2	24.8
Skilled workers	10.6	18.5
Others	6.4	6.7
Number of usual members		
1-4	32.5	35.3
5-8	57.2	55.2
9+	10.3	9.5
Mean household size	5.6	5.5
Total Percent	100.0	100.0
No. of Households	360	745
No. of villages	7	15

NSP : Not covered villages under Sri Satya Sai Water Project
SP : Covered villages under Sri Satya Sai Water Project

Table.2: Household distribution of water and utilization and time management in SP and NSP villages

Characteristics	NSP villages	SP villages	
		Before the scheme	After the scheme
Source for Bathing, Washing & Drinking			
Residence tap by PWS	1.4 (5)	2.1 (16)	1.9 (14)
Public tap by RWS	(77)	23.1 (172)	3.4 (25)
Public tap by SSSWSP	--	--	87.8 (654)
Public Hand pump	(242)	66.2 (493)	6.2 (46)
Other sources like Agriculture Bore wells	(4)	(9)	(1)
Public Wells	(32)	7.4 (55)	0.7 (5)
Distance number (in meters)			
<50	21.7 (78)	22.4 (167)	64.2 (478)
50-100	28.9 (104)	25.5 (190)	25.2 (188)
100-200	28.1 (101)	27.0 (201)	8.6 (64)
>200	21.4 (77)	25.1 (187)	2.0 (15)
Median	**100**	**120**	**50**
Time (in minutes)			
<10	9.4 (34)	10.6 (79)	33.2 (247)
10-20	26.7 (96)	28.6 (213)	50.3 (375)
20-30	15.6 (56)	28.3 (211)	11.3 (84)
>30	48.3 (174)	25.1 (187)	5.2 (39)
Average	**31.8**	**27.9**	**16.4**
Number of Trips			
<2	31.1 (112)	55.8 (416)	15.8 (118)
3-4	58.9 (212)	39.3 (293)	73.3 (546)
>4	10.0 (174)	4.8 (36)	10.9 (81)
Average	**3.1**	**2.6**	**3.3**
Using same source for Drinking water			
Yes	96.7 (348)	100.0 (745)	85.4 (636)
No	3.3 (12)	(0)	14.6 (109)
Reasons for not Drinking water			
Salty water	3.3 (12)	(0)	45.8 (50)
Muddy/colored water	(0)	(0)	24.7 (27)
High chloride taste water	0.0 (0)	0.0 (0)	29.3 (32)
Collection of water			
House Head (male)	9.4 (34)	17.4 (130)	5.0 (37)
House wives	68.6 (247)	75.6 (563)	40.4 (301)
Children	21.9 (79)	6.9 (52)	55.0 (407)

Note: Parenthesis indicates the frequency of the households.
NSP : Not covered villages under Sri Satya Sai Water Project
SP : Covered villages under Sri Satya Sai Water Project

Table.3: Household distribution of water utilization among according to seasons between SP and NSP villages.

Characteristics	NSP villages	SP villages
Saving Time		
Yes	---	56.4 (420)
No	---	43.6 (325)
Time utilizing in.		
Going early to field work	---	18.1 (76)
Any other house work	---	77.4 (325)
Going early to school	---	4.5 (19)
No. of days to store		
One day	57.9 (84)	92.8 (311)
Two days	42.1 (61)	7.2 (24)
During rainy season		
Sufficient for Drinking water and Washing	96.4 (347)	98.3 (732)
Sufficient for Drinking water but not washing	3.6 (13)	1.7 (13)
During summer season		
Sufficient for Drinking water and Washing	14.7 (53)	49.0 (365)
Sufficient for Drinking water but not washing	11.7 (42)	30.6 (228)
Scarce supply	73.6 (265)	20.4 (152)
During winter season		
Sufficient for Drinking water and Washing	91.9 (331)	92.1 (686)
Sufficient for Drinking water but not washing	5.6 (20)	6.9 (52)
Scarce supply	2.5 (9)	(7)
Extra efforts in summer		
Yes	(308)	(224)
No	(52)	(521)

Note: Parenthesis indicates the frequency of the households.
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Table.4: Differentials in social attitude hygenic habits and daily routine activities between SP and NSP villages.

Characteristics	NSP Villages	SP villages	
		Before the scheme	After the scheme
Pains			
More body pains	37.5 (135)	19.1 (142)	14.6 (109)
Tiredness	27.5 (99)	30.2 (225)	24.8 (185)
More body pains & Tiredness	29.2 (105)	13.8 (103)	11.3 (84)
No Pains	5.8 (21)	36.9 (275)	49.3 (367)
Queue System			
Follow a long queue	56.9 (205)	46.3 (345)	30.1 (224)
Rarely we follow queue	32.5 (117)	22.4 (167)	14.1 (105)
Not necessary to follow queue	10.6 (38)	31.3 (233)	(416)
Quarrels			
Frequently occurred quarrels	65.3 (235)	51.8 (386)	31.9 (238)
Rarely	22.2 (80)	33.8 (252)	26.6 (198)
No quarrels	12.5 (45)	14.4 (107)	41.5 (309)
Exchange of water			
Yes	18.1 (65)	23.5 (175)	41.7 (311)
Rarely	29.4 (106)	(226)	18.3 (136)
No	52.5 (189)	46.2 (344)	40.0 (298)
No. of Pots			
Below 10	60.3	32.0	0
10-14	15.9	30.6	20.7
15 & above	23.9	37.5	79.4
Average	10	12	22
Bath			
Twice in a day	0.0 (0)	0.0 (0)	12.6 (94)
Daily	15.3 (55)	24.9 (186)	34.2. (255)
Six times in a week	22.5 (81)	30.2 (225)	32.6 (243)
Five times in a week	20.0 (72)	15.0 (112)	11.8 (88)
Four times in a week	13.1 (47)	14.4 (115)	8.7 (65)
Thrice in a week	29.2 (105)	15.4 (115)	0.0 (0)

Note: Parenthesis indicates the frequency of the households.
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Table 5: Prevalence rates of diseases with in 3 months prior to survey by background characteristics in SP and NSP villages

Characteristics	NSP villages	SP villages
Sex		
Male	215	149
Female	249	171
Age		
<5	148	126
5-14	121	103
15-29	176	115
30-49	273	199
50-64	485	279
60+	593	242
Education		
Illiterates	292	205
Literates, Middle completed	208	139
Metric and above	162	114
Occupation		
Labours	271	201
Landlords	236	160
Skilled Workers	301	166
House wife	337	193
Others	141	98
Diseases		
Seasonal Diseases[1]	65	77
Waterborne Diseases[2]	19	13
Skin Diseases	14	9
Dental Problems	36	14
Arthritis	91	29
Loss of hair	0	14
Others[3]	6	3
Total	231	159

Note: 1 Seasonal diseases are cough/cold and High fever.
2 Waterborne diseases are diarrhea, jaundice, worms, gastroenteritis and typhoid.
3 Other diseases are breathing problem, measles, chiken-fox and stomachache.

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