Validation Study of Community Health Workers Assessment of Oral Hygiene in Karambayam, Tamil Nadu

By

Ravikumar Chockalingam, Dillip Tripathy, Shruti Mukherjee, Geetha Loganathan

Background

Oral health care very often has low priority, both in developed and in developing countries. Most resources devoted to health are channelled towards the control of communicable (infectious) diseases[1]. The World Dental Federation, WHO and the International Association of Dental Research (IADR) devised the Global oral Health goals in 1981 and later revised and envisaged for the year 2020[2].

There is increasing evidence linking impaired oral hygiene to various health conditions such as pancreatic cancer in Men[3], role of periodontal disease as a risk factor for stroke/TIA[4], greater prevalence of severe periodontal disease among individuals with type I and II diabetes among individuals in the age group 15-24 years of age[5].There is also increasing evidence that periodontal disease has been associated with low birth weight and pre-term deliveries[6]. The broad framework of the global oral health goals takes into account the regional variance in the existing state of oral health and aims at reducing pain, improving functional status, reducing infections, prevention of cancer and a number of dental manifestations of impaired oral health such as dental caries, mucosal disorders, salivary gland disorders etc. Oral health, integrated with general health and support for community programmes offering 'essential oral health' within primary health care (PHC) is increasing[7].

Validation of CHW's Assessment

Community oriented outreach programs using alternate human resources for identifying and promoting primary, preventive care has been well studied. One such study is by **Darmstadt *et al.*** validating the community health workers

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[1] **FDI World Dental Federation**, "Global Oral Health", www.fdiworldental.org/

[2] **Hobdell et al.,** "Global Goals for Oral Health 2020", *International Dental Journal*, 53 (***2003***), 285 - 288

[3] **Michaud et al.,** "A Prospective Study of Periodontal Disease and Pancreatic Cancer in US Male Health Professionals", *Journal of the National Cancer Institute*, 99 (***2007***), 171 - 175

[4] **Elter et al.,** " Relationship of Periodontal Disease and Edentulism to Stroke/TIA", *Journal of Dental Research*, 82 (***2003***), 998 - 1001

[5] **Taylor et al.,** " Bidirectional Interrelationships Between Diabetes and Periodontal Diseases", *Annals of Periodontology*, 6 (***2001***), 99 - 112

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[6] **Davenport et al.** "Maternal Periodontal Disease & Preterm Low Birth Weight", *Journal of Dental Research*, 81 (***2002***), 313 - 318

[7] **Monajem et al.**, MIHMEP Program, "The WHO's Action Plan for Oral Health", International *Journal of Dental Hygiene*, 7 (***2009***), 71 - 73

assessment of neonatal illness in Mirzarpur in Bangladesh[8]. The study showed that the community health workers identified with high validity, neonates with severe illness needing referral – level care which appears to be a promising strategy towards improving neonatal health and survival in low - resource developing countries. Although they did not show any impact on reducing the incidence of neonatal illness, the role of Community Health Worker's (CHW) as an alternate source for early diagnosis and referral of severe illness was illustrated.

Oral Hygiene and Health

The impact of community dentistry on health outcomes has been showed by a few models using alternate human resources. Periodontal disease is induced by bacterial plaque that stimulates a host response in the adjacent gingiva that leads to the destruction of connective tissue and bone[9]. ***Taylor et al.*** reviewed the association of diabetes with periodontal health and periodontal infection in turn having an adverse effect on glycemic control and incidence of diabetes complications[10]. Further rigorous study is necessary to establish unequivocally that treating periodontal infections can contribute to glycemic control management and to the reduction of the burden of diabetes complications. ***Wu et al.*** studied periodontal disease as a potential risk factor for coronary artery disease and stroke. Their results showed that individuals with periodontal disease were twice as likely as individuals without periodontal disease to have experienced non-hemorrhagic stroke and were also at an increased risk of cerebro-vascular disease[11]. ***Offenbacher et al.*** studied the potential impact of periodontal diseases on preterm deliveries and low birth weight infants. They documented women with low birth weight infants as a consequence of either preterm, premature rupture of membranes tend to have more severe periodontal disease than mothers of full-term, normal birth weight infants. After controlling for known risk factors, they concluded that severe periodontitis was associated with a 7.5 to 7.9 time fold increase in the risk of low birth weight[12].

[8] **Darmstadt et al**., "Validation of Community Health Worker's Assessment of Neonatal Illness in Rural Bangladesh", *Bulletin of WHO*, (***2009)***, 1 - 80

[9] **Liu et al**.,"Diabetes Enhances Periodontal Bone Loss through Enhanced Resorption and Diminished Bone Formation", *Journal of Dental Research, 85 (**2006**),* 510 - 514

[10] **Taylor et al.,** "Periodontal Disease: Associations with Diabetes, Glycemic Control and complications", *Oral Diseases,* 14 ***(2008***), 191 - 203

[11] **Wu et al.**, "Periodontal Disease and Risk of Cerebrovascular Disease", *Archives of Internal Medicine* , 160 ***(2000)***, 2749 - 2755

[12] **Offenbacher et al.**, "Periodontal Infection as a Possible Risk Factor for Preterm Low Birth Weight", *Journal of Periodontal Research* 67,***(1996),*** 1103 - 1113

Our primary objective is to make a strong case to show the potential of community health workers in identifying manifestations of oral hygiene such a **plaque, gingivitis and caries** which lead to a number of oral and systemic conditions ranging from oral diseases, cancer, cardiac pathology and pre-term labour and to study the impact of community health workers in improving oral hygiene in the community.

Objective

The scope of this study is to understand the role that CHWs can play in diagnosing impaired oral hygiene specifically looking at dental plaque, caries and gingivitis and validate their assessment through re-examination of the random sample by a certified dentist.

Research Question

- Validation of CHW's assessment of impaired oral hygiene in the diagnosis of dental plaque, dental caries and gingivitis

Empirical Research Methodology

ICTPH (www.ictph.org.in) had conducted a baseline study of 3 villages in the Thanjavur district of Tamil Nadu which consisted of an extensive household survey and a study of different variables using invasive and non-invasive methods. Karambayam was one of the three villages surveyed in Thanjavur.

Research Protocol

Karambayam belongs to the Pattukottai Taluk in Thanjavur district of Tamil Nadu. The population of Karambayam figures a little more than 3600 people with 907 households. The study covers the population in the age group 19 to 64 from Karambayam which includes 2532 people based on information gathered from the community health workers[13].

ICTPH has mobilized 20 volunteers from the community as CHWs ***(ICTPH – Nala Oli)***[14], most of them involved in self help groups. They have been undergoing

[13] Through ICTPH – CHW program a household level census survey of Karambayam was conducted. The population for the Oral Hygiene Survey has been defined based on survey results.

[14] Nala Oli means "*Health Light*". The term was coined by ICTPH - CHW training team.

training for preventive and promotive healthcare to collecting information about the community on health related problems in the region as facilitated by the CHW training team at ICTPH. For the oral hygiene research project, adult population between 19 to 64 years of age was selected. Out of the total population of eligible subjects, a random sample of 72 subjects was drawn using WinPepi[15] and nMaster software. The envisaged time-line for the proposed Oral Hygiene study is detailed in ***Appendix-I***.

The CHWs will be trained for 2 days (***Appendix – II:*** *Schedule for Training)* at the ICTPH, Thanjavur field office by trained specialists using both didactic tools and practical sessions. The *'CHW Training Curriculum'* is detailed in ***Appendix-III***. The CHWs will be given practical demonstrations on how to conduct oral examination diagnosing caries and oral examination with tongue depressor to diagnose gingivitis, using disclosing solutions[16] to diagnose plaque (***Appendix IV*** *– 'Dental Kit',* provided to all CHW's participating in the study). The diagnosing capabilities of CHW's will be evaluated through a set of in-house developed '*Assessment Tools'* - with both theoretical and practical components ***(Appendix – V).*** CHWs will conduct the prescribed dental tests as per the defined '*Protocol for Study'* ***(Appendix VI)***. These protocols were developed in-house based on the two day training imparted to CHW's. The subject specific observation/assessment of the randomized sample as conducted by the CHW will be recorded in the specified '*Dental Study Form'* (***Appendix VII)*** with pre-populated house-hold details. For all the above mentioned procedures, due consent will be obtained from the subject through the IRB (Institutional Review Board) approved '*Consent Form'* ***(Appendix – VIII)***. The *Dental Survey Form* will be digitized by data entry operators in Thanjavur using the Microsoft Excel software. An inter-observer reliability test between the CHWs will be done using kappa and test-retest methods on a sample drawn out of the random sample for the study using SPSS 16. Validation of the CHW diagnoses will be conducted through a certified dentist, as the gold standard, the same will be analysed using statistical measures like sensitivity, specificity and predictive values.

[15] © 2004 Abramson; licensee BioMed Central Ltd, http://www.epi-perspectives.com/content/1/1/6

[16] Disclosing solution is a red disclosing agent to diagnose dental plaque. It contains Erythrosine dye which stains the plaque into a red stain on topical application

Appendix I – Time Line for the Study

	Tasks/Activities	INCREMENT ON A WEEKLY INTERVAL FROM MARCH 01st 2009												
		MARCH				APR				MAY				JUNE
		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
1	Research Design													
2	Literature Review													
3	Developing Training Material/protocols for the study													
4	Conducting Training sessions of CHWs													
5	Field Survey													
6	Data Entry													
7	Data Analysis													
8	Draft Report Preparation													
9	Final Report Submission													

Appendix II – Schedule for Training

	27.04.2009	
10:00 - 10:15	Inauguration + Welcome Song	
10:15 - 11:15	Introduction to Oral Health	Dr.Geetha
11:15 - 11.30	Tea Break	
11:30 - 13:00	Learning about Oral Diseases	Dr.Geetha
13:00 - 13:45	Lunch	
13:45 - 16:00	Training on Oral Examination	Dr.Geetha
16:00 - 16:15	Tea Break	
16:15 - 17:00	Feedback	Team
	END OF DAY 1	
	28.04.2009	
10:00 - 10:15	Welcome Song	
10:15 - 10:30	Feedback	Dr.Geetha
10:30 - 12:30	Training on Oral Examination	Dr.Geetha
12:30 - 13:00	Lunch	
13:00 - 14:30	Interventions	Dr.Geetha
14:30 - 15:00	Feedback	Team
15:00 - 15:15	Tea Break	
15:15 - 16:00	Written Test	
16:00 - 17:00	Practical Test	
17:00 - 17:15	Assessment	Team
17:15 - 17:30	Anthem	

Appendix III – CHW Training Curriculum

As part of ICTPH Community Health Programme in Thanjavur, the team is conducting a community based research using the CHW's to assess the oral hygiene in the village of Karambayam The community health workers will be trained for a period of two days in the Thanjavur office on assessment of oral hygiene and diagnosis of Dental Plaque, Gingivitis and Caries.

GOAL: To Validate the CHW's assessment of oral hygiene in the community

Needs assessment

Basic Needs: Has been identified based on discussion with community health consultants and review at ICTPH.

Participants Expressed Need: Participants needs will be identified with discussions

General Objectives

On completion of the 2 days training the community health workers will be able to

- Describe anatomy and overview of the oral cavity
- Describe oral diseases such as Dental plaque, caries and gingivitis
- Discuss various methods of assessing oral diseases
- Explain key interventions associated with oral hygiene
- Respond correctly to a post evaluation questionnaire and practical test

Methodology

Methods: Power point presentations, lectures, experience sharing, group work, group discussions.

Resource Persons: Ravikumar Chockalingam, Dillip Tripathy, Shruthi Mukhejee, Geetha Loganathan

Implementation

Venue: Thanjavur

Dates: April 07-08 , 2009

Coordinator: Ravikumar Chockalingam

Medium: Tamil

Evaluation

Monitoring: Observation and follow-up of participation during training

Evaluation: Assessment Tools (Theoretical and Practical Examination)

Specific Objectives

- Describe anatomy and overview of the oral cavity
    - To get a complete understanding of the anatomy of oral cavity
    - To clearly understand the functioning of oral cavity
- Describe oral diseases such as dental plaque, caries and gingivitis
    - To clearly understand the causes and presentation of dental plaque
    - To clearly understand the causes and presentation of caries
    - To clearly understand the causes and presentation of gingivitis
- Discuss various methods of assessing oral diseases
    - To understand the various methods of diagnosing dental plaque
    - To understand the various methods of diagnosing caries
    - To understand the various methods of diagnosing gingivitis

- Explain key interventions associated with oral hygiene
  - Understand the methods to prevent dental plaque
  - Understand the methods to cure early disease
  - Understand the methods to prevent caries
  - Understand the methods to prevent gingivitis
- Respond correctly to a post evaluation questionnaire and practical test
  - Assess the learning's of the community CHWs by way of a written test
  - Assess the practical learning's regarding diagnosis of dental plaque, dental caries and gingivitis.

Appendix IV – Dental Kit

Items provided to all CHW's participating in the Oral Hygiene Study

- Oral health survey consent form
- Dental study form
- Protocol sheet for reference
- Disposable Mask
- Disposable gloves
- Disposable tongue depressor
- Dispensing solution
- Cotton buds
- Pen/Dye for thumb impression
- File/Folder to carry forms
- CHW bags

Appendix V – Assessment Tools

Questionnaire for Theoretical Evaluation of CHW on Oral Diseases

Multiple Choice Questions – Written Evaluation

Date: 27th and 28th April 2009

1) Dental Plaque is caused by:

a. Excess Sleeping
b. Excess Eating
c. Bad oral hygiene
d. Consumption of Alcohol

2) Dental Plaque can lead to:

a. Gastric problems
b. Headache
c. Gum problems and Dental Caries
d. Insomnia

3) Dental Caries leads to:

a. Tooth ache
b. Excess sensitivity of tooth
c. Cavity
d. All of the above

4) Symptoms of Dental caries are:

a. Sensitive feeling from the tooth
b. Toothache
c. All of the above
d. None of the above

5) Gingivitis is a form of:

a. STD
b. Neurological disease

c. Communicable disease
d. Gum disease

6) To prevent Oral Disease, one should:

a. Eat a balanced healthy diet
b. Adapt healthy habits
c. None of the above
d. All of the above

7) Oral hygiene means:

a. Keeping nails clean
b. No dandruff
c. Keeping hands clean
d. Keeping teeth clean and regular brushing

8) Tooth brushing should take minimum of:

a. 10 seconds
b. 1 minute
c. 2.5 minutes
d. None of the above

9) While brushing, we should hold the brush at an angle of:

a. 90 degrees
b. 180 degrees
c. 60 degrees
d. 45 degrees

10) Dental plaque will lead to

a. Bad breath
b. Indigestion
c. Vomiting
d. diarrhoea

11) While brushing, we should begin with cleaning:

a. The lower jaw
b. The upper jaw
c. Anywhere

12) We should have a Balanced Diet in order to:

a. Improve oral hygiene
b. Have Healthy gums and teeth
c. All of the above
d. None of the above

13) While eating, we should generally avoid:

a. Sour food
b. Green vegetables
c. Sweet and sticky food
d. Cold drinks

14) Food that is good for your oral hygiene is:

a. Low in sugar level
b. High in sugar level
c. None of the above
d. All of the above

15) A dentist is a doctor for:

a. Teeth
b. Bones
c. Heart
d. All of the above

16) Smoking can lead to:

a. Enhancing good breath
b. Reduction of Gum diseases
c. Staining of teeth
d. Headache

17) We should brush our teeth:

a. Once a week
b. Twice a day
c. Once a day
d. Twice a week

18) How do you examine the subject?

a. Lying down
b. Sitting upright
c. Standing position
d. None of the above

19) What precaution do you take for yourself before examining the subject?

a. Drink water
b. Wear gloves and masks
c. Talk to the patient
d. All of the above

20) While examining the subject you should start from which jaw?

a. Upper jaw
b. Lower jaw
c. Both the jaws together
d. Molar teeth

21) If the subject does not have carious teeth how do you record it in the dental form?

a. Mark '0' (zero) in the form
b. Mark '1' (one) in the form
c. Mark '10' (ten) in the form
d. Mark '2' (two) in the form

22) If the subject has red, swollen and bleeding gums how do you record it in the dental form?

a. Dental Caries
b. Gum disease
c. Gingivitis
d. Tooth ache

23) With help of what do you apply the disclosing solution on the teeth?

a. Pins
b. Cotton buds
c. Mouth mirrors
d. None of the above

24) How many minutes do you wait after the applying the disclosing solution on the teeth?

a. 10 minutes
b. One hour
c. 15 minutes
d. One minute

25) If the subject has dental plaque and the disclosing solution is applied it changes into what colour?

a. Red colour
b. Colourless
c. Blue colour
d. Grey colour

Answers to the Theoretical Evaluation Test

1. C
2. C
3. D
4. C
5. D
6. D
7. D
8. C
9. D
10. A
11. B
12. C
13. C
14. A
15. A
16. C
17. B
18. B
19. B
20. A
21. A
22. C
23. B
24. A
25. A

Practical Evaluation:

1. **To evaluate whether CHWs follow the protocol for the examination of the subjects. [10]**

- *Completion of dental consent form [4]*
- *Wearing of the glove and mask [4]*
- *Making the subject sit in a chair in an upright position [2]*

2. **To evaluate whether the CHWs count and record the total number of teeth in the upper and lower jaw. [20]**

- *If they record correctly the total number of teeth in upper jaw [10]*
- *If they miss 4 teeth in upper jaw [7]*
- *If they miss >= 5 teeth in upper jaw [0]*
- *If they record correctly the total number of teeth in lower jaw [10]*
- *If they miss 4 teeth in lower jaw [7]*
- *If they miss >= 5 teeth in lower jaw [0]*

3. **To evaluate whether the CHW's identify the number of carious teeth in the upper and lower jaw. [20]**

- *If they record correctly the number of carious teeth in upper jaw [10]*
- *If they miss 2 carious teeth in upper jaw [7]*
- *If they miss >=3 carious teeth in upper jaw [0]*
- *If they record correctly the number of carious teeth in lower jaw [10]*
- *If they miss 2 carious teeth in lower jaw [7]*
- *If they miss >=3 carious teeth in lower jaw [0]*

4. **To evaluate whether the CHW's identify the presence / absence of gingivitis in the upper and lower jaw. [20]**

- *If they identify gingivitis as per dentist assessment in upper jaw [10]*
- *If they don't identify gingivitis in upper jaw [0]*
- *If they identify gingivitis as per dentist assessment in lower jaw [10]*
- *If they don't identify gingivitis in lower jaw [0]*

5. **To evaluate whether the CHW's follow the protocol to apply the disclosing solution on all the surface of the teeth, both in the upper and lower jaw. [10]**

- *If they apply the disclosing solution on all the surfaces of the teeth of upper jaw [5]*
- *If they do not apply the disclosing solution on all the surfaces of the teeth of upper jaw [0]*
- *If they apply the disclosing solution on all surfaces of the teeth of lower jaw [5]*
- *If they do not apply the disclosing solution on all the surfaces of the teeth of lower jaw [0]*

6. **To evaluate whether the CHWs identify the presence / absence of dental plaque in the upper and lower jaw. [20]**

- *If they identify correctly the presence of plaque in the upper jaw after waiting for 10 minutes as per the dentist assessment [10]*
- *If they don't identify the presence of plaque in the upper jaw as per the dentist assessment [0]*
- *If they identify correctly the presence of plaque in the lower jaw after waiting for 10 minutes as per the dentist assessment [10]*
- *If they don't identify correctly the presence of plaque in the lower jaw as per the dentist assessment [0]*

Assessment Scoring System

Theoretical Evaluation (25X4)	:	100 MARKS
Practical Evaluation	:	100 MARKS
TOTAL		200 MARKS

Less than 100	:	Below average
100 - 120	:	Average
More than 120	:	Above average

To be part of the Oral hygiene study the CHW will have to score more than 100 in the assessment tests.

Appendix VI – Protocol for Study

Preparation for Examination

- Aid '*Consent Form*' completion by the subject, obtain valid signature/ thumb impression
- CHWs should wear disposable gloves and masks before handling the subject
- Subject to be stationed in an upright position by the CHW
- CHW to follow the below-listed steps to identify Dental plaque, Gingivitis and Caries

Protocol for identifying the total number of true teeth in the upper and lower jaw

- Ask the subject if he/she has any removable dentures
- If present, ask the subject to remove them
- Count the number of true teeth in the upper jaw and enter in the dental study form
- Count the number of teeth in the lower jaw and enter in the dental study form

Protocol for Identifying Dental Caries by CHWs

- Inspect visually all tooth surfaces with the help of a torch light or natural light with the help of a tongue depressor
- First examine the Upper jaw
- Start from the right side, then front and then left side of the upper jaw
- Summation of the number of teeth having dental caries in the upper jaw
- Record the number of carious teeth in the upper jaw in the sheet provided
- If no caries record it as '0'

- Now examine the Lower jaw
- Start from the right side, then front and then left side of the jaw
- Summation of the number of tooth having dental caries in the lower jaw
- Record the number of carious teeth in the sheet provided
- If no caries, record it as '0'

Protocol for Identifying Gingivitis by CHWs

- Inspect visually all tooth surfaces with the help of a torch light or natural light with the help of a tongue depressor
- First examine the Upper jaw
- Start from the right side, then front and then the left side of the jaw
- Look for red, swollen, bleeding gums in the upper jaw
- Record in the sheet provided whether the subject is having gingivitis in the upper jaw by ticking in the relevant section
- Now examine the Lower jaw
- Start from the right side, then the front and then the left side of the jaw
- Look for red, swollen, bleeding gums in the lower jaw
- Record it in the sheet provided whether the subject is having gingivitis in the lower jaw by ticking in the relevant section

Protocol for Identifying Dental Plaque by CHW

- Apply the disclosing solution on all the surfaces of the teeth, both in the upper and lower jaw, with the help of the cotton buds
- Wait for 10 minutes
- Look of the colour change [red colour] 
- Based on the colour change, record it in the sheet provided whether the subject is having dental plaque in the upper and lower jaw by ticking at the relevant section

After completion of the form, please take the signature of the subject in the space provided.

Appendix VII – Dental Study Form

Sl. No	Name of CHW	Age	Sex	Address

					Please put the tick mark (✓) in the appropriate boxes given below										
S.No.	Subject Name	Age	Sex	Address	Total Number of True Teeth		No of Caries Teeth		Gingivitis				Dental Plaque		Signature of the Subjects
					Upper Jaw	Lower Jaw	Upper Jaw	Lower Jaw	Upper Jaw		Lower Jaw		Yes	No	
									Yes	No	Yes	No			
1															
2															
3															
4															
5															

Thank You for your cooperation!

Name and Signature of the interviewer

Appendix VIII – Consent Form

ORAL HYGIENE SURVEY

Good Morning Sir/Madam! Questionnaire Number: □ □ □

Household Code: □ □ □ □ □

TEST DATE:					0	9	START TIME:			:			AM/PM
TEST PERFORMED BY:													
CONSENT FORM READ BY:													

INFORMED CONSENT FOR ORAL HYGIENE SURVEY

We would like to ask you to participate in the oral hygiene test. As part of the survey, we want to understand your oral health status. The tests use a disclosing solution to test the dental hygiene. This is completely safe. The cotton used is completely sterilised and clean .The results and observations of the tests will be given to you immediately. The results and observations will be kept confidential.

The results and observations of your ORAL HYGIENE assessment will be recorded in the accompanying "DENTAL STUDY FORM". Kindly sign the dental survey form after successful completion of the survey.

We would like you to know the possible risks and benefits involved in this.

Risks

- Time involvement
- Disruption of routine
- Slight discomfort while doing the test
- Revelation to personal information – Health information about you obtained from studying your oral hygiene.

Benefits

- You'll know about your oral hygiene.
- You'll learn how to keep your teeth clean and healthy.

If you have any questions about this survey you may ask me or contact (IKP Centre for Technologies in Public Health, Dr. Ravikumar Chokalingam, 1-Cenotaph Road, Teynampet, Chennai 600 018) or (Supervisor at site). Signing this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

Do you have any questions?

Hoping for your approval for the proposed study.

Do you agree to participate in the Oral Hygiene check up which includes an Oral examination and a disclosing solution test? Yes [ ]; No [ ];

If agreed then signature/Thumb print of the subject

Name and Signature of the interviewer