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- Ethiopian National Immunization Coverage Survey.
- Improving Skilled Birth Attendance in Ethiopia: An Evidence Brief Under Preparation.
- Safety and Potency Test of Cell Culture Based Anti-rabies Vaccine Produced in Ethiopia.
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SNL Editorial Committee

Ms. Meraf Woldeamanuel
Mr. Mesfin Tefera
Dr. Abraham Ali
Ms. Melat Tsegaye
Mr. Elias Asfaw
Mr. Abinet Tekile
Dear Readers,

We couldn’t be more excited to have made it to this point, our newsletter Ye Science Admas has reached its third edition. We would like to offer our earnest thanks for all who contributed and responded to our call for articles in this third issue. Along these processes, we as editors have acquired a significant learning experience from the past two issues. The experience and feedback received from the diversified readers on the previous two issues are well addressed on this issue. It is our sincere hope that you will enjoy reading this third issue of Ye Science Admas.

As one of the dissemination channels of EHNRI’s research findings, this compiled scientific publication pays due attention to public health oriented and strategic focused research projects. These researches are aimed to advocate major findings achieved by the institute on the 2005 Ethiopian Fiscal Year (EFY) that provide informed decision making by the different level of stakeholders on national and global level. Moreover, our newsletter serves to keep key stakeholders and clients updated on progress being made by EHNRI on major thematic research agendas.

This issue of Ye Science Admas features wide range of interesting and pertinent topics. From Immunization Coverage, Improving Skilled Birth Attendance, Anti-rabies Vaccine Trials to Effective Modalities to improve pregnant women compliance to the daily prenatal Iron-Folic Acid (IFA) supplementation. Researchers profile is part of our regular editorial lineup hence, in this issue you will also read the profile of a senior woman researcher in our institute. In our effort to expand our editorial content we have also added an article that feature Evolution of EHNRI.

As editors, we would like to encourage the top management, senior and junior researchers in the institute to augment the level of involvement and commitment to sustain the publication of this young and emerging scientific newsletter. It is noteworthy that this scientific newsletter plays a crucial role in opening the institute’s door for wide and diversified stakeholders and partners nationally and internationally. We would like to thank you again for your significant contribution, and reiterate our genuine hope that you will find the content on this issue to be fascinating and relevant to give you updated & informed evidence.

Lastly, we have a learning spirit and very welcoming attitude for your formative comments, suggestions and ideas. We are always striving to increase the accessibility and improvement of the quality of this scientific newsletter to suit the recommended scientific level of standard. In order to reach more readers/audiences, Ye Science Admas is now available online through the institute’s website. For those with limited internet access, hardcopies are ready to be disseminated. As we move to reach more readers, if you or someone outside of EHNRI would like to be added to our distribution list, you are most welcome.

With best Wishes,

The Editors
The all-stone building which is gracefully landing in the spacious campus of EHNRI was built in 1930 by an American missionary named Dr. Thomas Lambie. It originally housed four doctors and five nurses and served as a hospital (George Memorial Hospital) to the society. Following Italian aggression in 1935, the hospital was confiscated by Italian fascist regime where its name was changed to Minstro Dela Sanita and its location moved to “Arat kilo” area. Soon after the fascist regime came to an end in 1940, the Ethiopian government took over Minstro Dela Sanita and re-named it Imperial Medical Research Institute with new legal status and after moving to several locations, it lastly moved to its original location in Gullele in 1950 though the building at the time was serving as Teferi Mekonen Hospital.

In 1952 the Imperial Ethiopian government made an agreement with institute Pasteur d’Paris which lead to the establishment of Institute of Microbiology with the name Institute Pasteur d’Ethiopie, this name is still used by the society. According to the contract agreement the newly founded institute had several departments called, Departments of bacteriological, parasitological and serological analysis, Departments of chemical analyses, Department of preparation of antivariolic vaccine, Department of preparation of antityphus and antitypho-paratyphoidal vaccines, Department of preparation of B.C.G vaccine, Department of antirabic analyses and preparation of antirabic vaccine and Department of preparation of other microbial vaccines. During that time each year the Institute was providing thousands of doses of vaccines for different diseases such as typhus, rabies, BCG, Yellow fever, etc...free of charge.

However, in 1965, the bilateral agreement with the Institute Pasteur d’ Paris was terminated and the institution, renamed as the Imperial Central Laboratory, was delivering its former service only now under the ministry of public health.

Nearly after twenty years in 1985 the Institute was reestablished again as “The National Research Institute of Health” its major objectives & responsibilities being to conduct research on major public health problems, deliver referral laboratory diagnostic services, provide training in laboratory technology.
Evolution of EHNRI: an overview

The Nutrition Research hand of EHNRI on the contrary has a relatively recent past, the first nutrition institute (Children Nutrition Unit, CNU) was established in 1970 in princess Tshay hospital (currently Armed force hospital). In 1976 the unit became Ethiopian Nutrition Institute (ENI) which had wider scope and more responsibilities. ENI played a big role during the 1980 drought and famine, the institute did not only conduct survey and surveillance activities in the drought affected areas, but also set up relief programs and training, feeding shelters, prepare supplementary food like Dubie and Edget, which eventually scaled up to production at industry levels. Needless to say, the ENI takes a deserved credit in nutrition intervention in Ethiopia.

The third hand of the institute, traditional medicine, was established in 1987 as an office in Ministry of health in recognition of the importance of the field, if integrated with the modern system, in serving as an alternative health resource readily available to both urban and rural communities hence expanding the health care coverage. The office’s mandate was to co-ordinates nationwide activities such as phytochemical screening, clinical evaluation of traditional health practices and surgical procedures, etc.

The aforementioned crucial institutions were merged to form the current Ethiopian Health and Nutrition Research Institute (EHNRI) with the following goals and objectives reflected in proclamation of the Council of Ministers No. 4/1996:

- The control of communicable diseases, epidemics and disease related to malnutrition;
- The development traditional medicine and its gradual integration into modern medicine;
- Applied health research on major health problems and application of research results;
- Strengthen research capacities of national institutions

Since its inception almost a century ago, the institute has made tremendous contributions towards the improvement of public health problems of the country. Taking into account priority public health issues and needs of the general public, the institute had been setting different priority strategies at different times to address the public demands. The Current institutional focus is doing coordinated research on priority disease having national importance and strengthening national public health laboratory services in the country. It is also the technical hand of the federal Ministry of Health.
Research Ethiopian National Immunization Coverage Survey

Habtamu Tek ile 1, Abebe Bekale 1, Mekonnen Tadesse 1, Theodros Getachew 1, James McQuen Patterson 2, Gavin Gram 3, Amha Kebdele 1, Yezihalem Kassa 1, Tariku Birhana 4, Nigisti Tesfaye 5, Tajudin Ahmed 5, Mengistu Ayalew 5, Aregai W/Gebriel 5, Francois Gasse 6, Dale Rhoda 7, Netsanet Berhanu 8

Introduction

The Expanded Program for Immunization (EPI) in Ethiopia, which was launched in 1980, has shown steady progress in increasing coverage for all antigens. Additional vaccines beyond the traditional ones, Hib and Hep-B in 2007 and PCV in 2011 were included in the routine immunization program. Performance report in 2010 showed wide variation as reported through Health Management Information System HMIS compared to Demographic and Health Survey (DHS) and other assessments. Administrative coverage (through HMIS) was reported as 87% for DPT-HepB-Hib3 in 2010, the DHS estimating DPT-HepB-Hib3 (1) to be 36.5% for 2010.

In order for meaningful and ongoing program decision-making, immunization coverage estimates are essential (2). Such estimates provide data on the success of immunization programs to reach every child and every pregnant woman and also give direction to program experts regarding how to improve programs. Given that coverage surveys should be completed every three to five years (the last was done in 2007), the Federal Ministry of Health (FMOH) decided to validate the administrative reports through an exclusive immunization coverage survey of high quality in 2012 (3, 4, 5).

Objective

The overall objective of the EPI survey was to determine the coverage of all antigens in children 12 to 23 months old and the proportion of children protected at birth from tetanus born to mothers 0 to 11 months prior to the survey at national and regional levels.

Methods

The survey was a multi-stage stratified cluster design, cross-sectional national survey. The survey sample frame was designed to provide estimates for the maternal and infant immunization status at the national level and for each of the nine regions and two city-administrations. The number of clusters was selected based upon an estimate of the number of eligible children in each cluster and resource availability. A cluster sample size of seven households (HH) for each of the two groups (tetanus immunization and infant immunization groups) was selected after review of inter and intra-cluster variability in the DHS 2011 survey. These data indicate that seven complete responses per cluster should yield immunization coverage estimates with 95% confidence intervals (CI) that are ±10% precision, based on a coverage estimate of 50% for most regions. At the national level, the precision was designed to be ±5%. In addition to HH surveys, a health facility staff questionnaire was administered at health centers in urban and rural clusters and at health posts only in rural clusters in the nearest functional government health facility for each surveyed cluster. Representative sample size for national and regional estimate was selected, 550 clusters, 50 from each region and in each cluster, 14 households were selected, seven houses with children 12-23 months and seven houses with infants, 0-11 months representing recently pregnant mothers; 19 clusters were replaced. Of the targeted sample, 98% for childhood immunization and 99.8% of mothers for maternal tetanus immunization were analyzed.

Results

Routine immunization coverage of children 12-23 months of age

Information on child immunization was obtained from 3,762 children aged 12-23 months, of whom 1,756 (46.7%) had immunization cards; and card availability by region ranges from 14.1% in Afar to 94.2% in Addis Ababa. Due to the relatively low-level of card availability, concerns have been raised about the completeness and accuracy of data collected via caregiver’s recall. The drop-out rates observed in the data when caregiver recall is the source of information is often twice as high as that seen for cards and EPI register. This analysis adjusts the DPT-HepB-Hib-3 coverage using the DPT-HepB-Hib-1-3 drop-out rate from card as a better estimate of the true drop-out rate for data collected by caregiver recall. The weighted Ethiopian EPI coverage is presented in Table.1.
Coverage for all antigens tends to be higher in children of caregivers with higher educational attainment, higher wealth, children of first parity, and those residing in urban areas. However, some factors, such as gender do not have a difference in coverage. The distance of a functioning health facility, measured as travel time to that facility, did not show a difference in immunization coverage for any antigen.

The mean DPT-HepB-Hib1 coverage was seen as an indicator of access to immunization services while the adjusted DPT-HepB-Hib3 coverage was seen as an indicator of utilization. The adjusted regional estimates of DPT-HepB-Hib3 range from 23% (Afar) to 96.4% (Addis Ababa). The national estimated mean measles coverage was 68.2% (95% CI: 62-74%) with regional estimates ranging from 34% (Afar) to 96% (Addis Ababa). In emerging regions with the highest proportion of coverage documented by mother recall and largest variation between card and history drop-out rates, the impact of the adjustment is highest.

The proportion of children fully vaccinated is those children who received all basic vaccinations including BCG, measles, and three doses each of DPT-HepB-Hib and OPV excluding polio vaccine given at birth. Nationally, the proportion of children receiving all basic vaccination is 50% ranging from 12.6% in Afar and Somali to 94.1% in Addis Ababa.

No vaccination means that there is no record and no recall from any source of the child having received any of the antigens listed in the above table. Nationally, only 7.4% of children aged 12 - 23 months were not vaccinated at least once, ranging from as high as 27.3% in Afar to as low as 0.2% in Addis Ababa.

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**Table 1** Estimated percentage of population 12-23 months of age who received specific vaccinations at any time before the survey, by source of information

<table>
<thead>
<tr>
<th>Source of information, region</th>
<th>BCG</th>
<th>DPT-HepB-Hib</th>
<th>Polio</th>
<th>Measles</th>
<th>Vitamin A</th>
<th>All basic vaccination</th>
<th>No vaccinations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source of information</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Vaccination card</td>
<td>33.2</td>
<td>36.7</td>
<td>32.0</td>
<td>29.1</td>
<td>7.1</td>
<td>35.7</td>
<td>31.2</td>
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<tr>
<td>HF register review</td>
<td>19.8</td>
<td>22.1</td>
<td>20.6</td>
<td>18.6</td>
<td>2.1</td>
<td>22.5</td>
<td>20.8</td>
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<tr>
<td>History</td>
<td>26.6</td>
<td>21.2</td>
<td>17.3</td>
<td>11.9</td>
<td>0.0</td>
<td>31.9</td>
<td>30.3</td>
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<tr>
<td><strong>Either source (total)</strong></td>
<td>79.6</td>
<td>80.0</td>
<td>69.9</td>
<td>*65.7</td>
<td>9.1</td>
<td>90.1</td>
<td>82.3</td>
</tr>
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<td><strong>Region</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADD</td>
<td>99.5</td>
<td>98.8</td>
<td>98.8</td>
<td>*96.4</td>
<td>93.9</td>
<td>99.1</td>
<td>98.9</td>
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<tr>
<td>AFA</td>
<td>48.0</td>
<td>44.5</td>
<td>29.4</td>
<td>*23.0</td>
<td>13.2</td>
<td>68.2</td>
<td>54.9</td>
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<tr>
<td>AMH</td>
<td>76.6</td>
<td>77.1</td>
<td>69.1</td>
<td>*62.2</td>
<td>6.0</td>
<td>86.4</td>
<td>79.9</td>
</tr>
<tr>
<td>BEN</td>
<td>77.7</td>
<td>76.6</td>
<td>66.6</td>
<td>*63.1</td>
<td>10.7</td>
<td>88.1</td>
<td>81.7</td>
</tr>
<tr>
<td>DIR</td>
<td>97.5</td>
<td>96.2</td>
<td>92.5</td>
<td>*89.6</td>
<td>42.3</td>
<td>97.8</td>
<td>95.9</td>
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<tr>
<td>GAM</td>
<td>80.0</td>
<td>73.9</td>
<td>55.1</td>
<td>*45.6</td>
<td>18.8</td>
<td>91.3</td>
<td>84.8</td>
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<tr>
<td>HAR</td>
<td>90.1</td>
<td>87.9</td>
<td>74.8</td>
<td>*67.9</td>
<td>33.2</td>
<td>97.0</td>
<td>88.1</td>
</tr>
<tr>
<td>ORO</td>
<td>78.8</td>
<td>80.2</td>
<td>67.0</td>
<td>*62.7</td>
<td>6.0</td>
<td>91.9</td>
<td>78.6</td>
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<tr>
<td>SNN</td>
<td>88.2</td>
<td>87.9</td>
<td>80.2</td>
<td>*79.3</td>
<td>7.5</td>
<td>92.3</td>
<td>90.6</td>
</tr>
<tr>
<td>SOM</td>
<td>49.9</td>
<td>49.6</td>
<td>33.5</td>
<td>*30.7</td>
<td>4.1</td>
<td>79.6</td>
<td>73.3</td>
</tr>
<tr>
<td>TIG</td>
<td>96.7</td>
<td>95.6</td>
<td>93.6</td>
<td>*88.3</td>
<td>21.0</td>
<td>96.8</td>
<td>95.0</td>
</tr>
<tr>
<td>ETH</td>
<td>79.6</td>
<td>80.0</td>
<td>69.9</td>
<td>*65.7</td>
<td>9.1</td>
<td>90.1</td>
<td>82.3</td>
</tr>
</tbody>
</table>

Note: All proportions in the table are survey weighted estimates of population proportions.
* Coverage adjusted using the DPT-HepB-Hib1-3 drop-out rate from card for history dose; the unadjusted national coverage was 59.5%.
Vaccination drop-outs

Dropout rates are used to measure program continuity and follow up. The dropout between the first and third doses, particularly DPT-HepB-Hib is the best indicator as this vaccine is not typically given during campaigns. In routine EPI programs, drop-out rates are higher than 10%, which usually indicate some quality problem with the program and need to be addressed.

This survey revealed high drop-out rates in the immunization program. The total unadjusted dropout rate (card, verification and history) for DPT-HepB-Hib1-3 was 25.6% nationally, ranging from 2.6% (Addis Ababa) to 63.8% (Somali). Only Tigray and Addis Ababa regions met the acceptable threshold target of ≤10% DPT-HepB-Hib1-3 dropout rate. In Dire Dawa, the drop-out rate (12.7%) was in moderate range (10.1%-20.0%) and all the remaining regions had drop-out rates >20%.

As illustrated in the graph below, the dropout rate by source of information is not the same. When examining only DPT-HepB-Hib coverage reported by history, the drop-out rate was substantially higher than the dropout rate when coverage was recorded by vaccination card or EPI register review. As indicated above, the DPT-HepB-Hib-3 coverage was adjusted by assuming the dropout rate for persons whose data was from recall or history was the same as the card dropout rate.

Often, the dropout from DPT-HepB-Hib1 to measles is higher than DPT-HepB-Hib 1-3 as measles vaccination is given after DPT-HepB-Hib3. In this survey, however, the dropout rate by history is negative, primarily because history includes measles vaccine is given through both routine and campaign strategies, likely inflating the routine measles coverage and distorting the dropout rate estimate.

Valid dose coverage of children 12 to 23 months for each antigen

To determine the likely level of immunity of the doses provided, a valid dose analysis was done. A valid dose is determined by the dose being given after the minimum age and with an appropriate interval between doses. Furthermore, timeliness of dose was also assessed, defined as a timely doses provided before 12 months of age. As only vaccination cards and EPI registers included the date of vaccination, the proportion of valid doses by history was assumed as equivalent to the proportion of valid doses by card. Overall coverage of valid dose by antigen for basic vaccines is given in Table 2 below.

Table 2. Percentage of children age 12-23 months who received specific vaccines in the appropriate time range by 12 months of age by region

<table>
<thead>
<tr>
<th>Re-</th>
<th>BCG</th>
<th>DPT-HepB-Hib</th>
<th>Polio</th>
<th>Measles</th>
<th>All vaccinators</th>
<th>No vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>86.8</td>
<td>84.9</td>
<td>80.1</td>
<td>88.9</td>
<td>87.2</td>
<td>86.1</td>
</tr>
<tr>
<td>ADD</td>
<td>94.7</td>
<td>88.5</td>
<td>86.8</td>
<td>84.9</td>
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<td>88.9</td>
</tr>
<tr>
<td>AFA</td>
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<td>11.3</td>
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<tr>
<td>AMH</td>
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<td>51.7</td>
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<tr>
<td>BEN</td>
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<td>39.8</td>
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<td>38.1</td>
</tr>
<tr>
<td>DIR</td>
<td>90.4</td>
<td>60.7</td>
<td>70.7</td>
<td>67.1</td>
<td>33.6</td>
<td>61.1</td>
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<tr>
<td>GAM</td>
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<td>20.2</td>
<td>14.4</td>
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<td>HAR</td>
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<td>50.5</td>
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<tr>
<td>ORO</td>
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<td>37.2</td>
<td>34.2</td>
<td>2.2</td>
<td>40.7</td>
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<td>SNN</td>
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<td>41.8</td>
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<td>3.2</td>
<td>37.2</td>
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<tr>
<td>SOM</td>
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<td>4.1</td>
<td>3.2</td>
<td>2.2</td>
<td>5.8</td>
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<tr>
<td>TIG</td>
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<td>76.2</td>
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<td>12.7</td>
<td>73.3</td>
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<td>ETH</td>
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</tbody>
</table>

Note: All proportions in the table are survey weighted estimates of popula-
Timely, valid doses for all antigens tend to be higher in children of caregivers with higher educational attainment, higher wealth, child of first parity and residing in urban areas. However, some factors, such as gender and mother’s age did not show difference in timely, valid dose coverage.

**Tetanus toxoid coverage among mothers of children 0-11 months of age**

Nationwide, the proportion of women who delivered in the last year who received at least one dose of TT is 79.9% and who received a second dose is 72.0% conferring immunity for three years. The coverage of TT doses increased among older women and those with higher child parity, high educational attainment, and those living in urban areas. On the other hand, women below 20 years with primipara and less than two ANC visits have lower coverage. National coverage for TT1 vaccine administered during the last pregnancy was 58.7% and for two or more was 44.8%. Based on the WHO definition for neonatal tetanus protection at birth, the results revealed that nationally 68% of children born are protected. These figures also vary across the regions ranging from 35% in Afar to 84% in Addis Ababa. Attended delivery is one of the most important indicators of maternal health care services and prevention of neonatal tetanus. According to the findings of this survey, deliveries attended by skilled health professional are, by far, lower than attendance by unskilled professionals and unattended deliveries.

**Characteristics of health facility serving assessed areas**

Health facilities (health posts and health centers) and health workers are the backbone of immunization service delivery, ensuring that national immunization policy is translated into an effective and usable service for women and children. In total, 585 government-run health facilities were assessed during the Ethiopian EPI Coverage Survey (2012), among which 298 were health centers and 273 were health posts.

The survey showed that 97.1% of the urban surveyed health facilities and 89.2% of rural health facilities provide routine immunization services on a regularly basis. However, routine EPI micro-plans that show the annual/monthly target number of children and the static and outreach/mobile sessions scheduled were available in just 78.4% of facilities providing immunization services. Of the assessed health centers, 51.4% provide daily sessions compared to health posts, which tended to provide immunization services on a monthly basis (75.7%). Though not cross checked from the records and the reporting formats, 42.5% of health facilities had a planned session interrupted in the last nine months.

The success of immunization depends on reliable provision of commodities through the supply chain and availability for use when and where needed in the correct quantities and at the right time. The results of the survey revealed that 92.1% and 77.9% of health posts and health centers, respectively, received the vaccine at least once in a month. With regard to the cold chain, 45.2% of health posts and 2.1% of health centers, reported absence of vaccine refrigerator. It is also reported that in health posts with refrigerators, 36.6% of refrigerators were not functioning due to shortage of kerosene while 33.0% of health centers reported non-functional refrigerators due to lack of maintenance; “refrigerator is not installed” accounted to 12.5% of unused refrigerators.

In the health facilities assessed that store vaccines overnight, 38.6% of health posts and 43.6% of health centers experienced stock-outs for one or more of the antigens during previous three months before the survey.

**Conclusion and Recommendations**

**Childhood immunization**

Access, as defined in EPI programs by DPT-HepB-Hib1 coverage, in our survey is 80% nationally, while utilization, defined by DPT-HepB-Hib3, was estimated to be 65.7% (adjusted). Access and utilization is low in most regions, though two regions (Somali and Afar) have the lowest levels of access and utilization with (DPT-HepB-Hib1 less than 50% and the DPT-HepB-Hib3 coverage less than 30%). Fully vaccinated children, completing immunizations timely (by 12 months of age) and with appropriate spacing between doses was 18.6% nationally. Child sickness is the main reason given by caretakers for not taking a child for vaccination.

**Recommendations**

1. High immunization drop-out rates could be improved by identifying and addressing the reasons for high drop-out, including service quality, availability of service and improved communication between vaccinator and community.
Research Findings

Ethiopian National Immunization...

2. Increasing community participation through intensive and extensive health education campaigns may also be required to increase utilization of MCH services in rural areas and increase access and availability of the vaccines.

3. Regular reviews of immunization performance, (nationally: semi-annually, regionally: quarterly, and woreda/health facility: monthly). In addition to reviewing performance, review should monitor data quality so that it accurately reflects true immunization coverage at all levels.

Maternal Health

The coverage of three doses of TT providing at least five years protection against tetanus is 61% nationwide and a significant proportion (40%) of women had received five or more doses of TT conferring a child bearing period protection. It increases as the number of ANC visits increases; 70%, 79% and 85% for mothers who attended one, two and three or more ANC visit for their last pregnancy, respectively. Mothers of children aged 0-11 months were also interviewed about their antenatal care during their most recent pregnancy and more than half (52.0%) attended at least one visit of antenatal clinics but the majority (80%) deliver at home. Moreover the percentage of deliveries assisted by skilled (health professional) is unacceptably low (14.0%).

Recommendations

4. Integration of TT immunization issues with the above childhood immunization recommendations, including improving review of levels of protection at birth, increasing data quality, and increasing community messages and participation.

5. Improving mothers’ utilization of ANC services and mothers having a clean delivery by skilled birth attendant is crucial. Methods may require increased community mobilization and improved service delivery,

6. Every ANC visit should screen TT immunization status of the pregnant women and administer doses to all eligible women, and

7. Create community awareness on clean cord care management and educate them on the risk of harmful traditional practices.

Health facility

According to the national standard, the health facilities are mostly accessible to the community. Though more than 90% of the health facilities are providing routine EPI service, only 24.4% are providing the services daily. In-service training on EPI service delivery was low for health facility staff within the past year (57%) while no training was provided to a large proportion of staff (30%). The defaulter tracing system exists in most (85%) of health facilities; however, the defaulter tracing system did not produce the expected impact on the dropout rates which is over 20% in most regions.

Most of the health facilities (88.7%) obtain the vaccine at least once in a month that is in line with the ideal plan of vaccine delivery, and most of the deliveries are conducted on foot/walking.

Recommendations

8. The health facilities need to establish a vaccine delivery strategy appropriate for their catchment population and available cold-chain equipment.

9. Proper vaccine stock management is required at all levels. It can be achieved through training and regular monitoring of central, regional, and facility vaccine stocks,

10. Avail transportation for the delivery of the vaccine, which is appropriate to the topography of the area (bicycle, motorcycle, vehicle),

11. Review deployment and maintenance of cold-chain equipment periodically at health facility level,

12. Defaulter-tracing should be improved and strengthened, and

13. There should be a proper in-service training program of EPI at regional and national level so as to enhance the service.

References


5. WHO/UNICEF. 20011. WHO and UNICEF Joint estimates on immunization coverage.
Skilled birth attendance in Ethiopia is the lowest in the world (1). Culture, illiteracy and poverty, among others play the most important role in prohibiting mothers from seeking skilled attendance during child birth. Unskilled birth attendance is considered as one of the main causes of high maternal mortality in low-income countries, as most obstetric complications occur around the time of delivery and cannot be predicted (2). The Federal Minister of Health of Ethiopia has recognized lack of skilled birth attendance as a key factor contributing to both high maternal and newborn mortality during pregnancy and delivery (3). Therefore it is important all pregnant women have access to skilled attendance (4) if the Millennium Development Goals 4 and 5 have to be achieved (5).

How big is the problem?

It is estimated that 90% of births in Ethiopia occur at home without skilled attendance though, thirty-four percent receive some level of antenatal care from a skilled provider, that is, from a doctor, nurse, or midwife, for their most recent birth.

The Global Picture of the Health Workers Reach Index ranks Ethiopia 4th from the bottom out of 161 countries; one of the parameters of the Index is skilled birth attendance. The target of the Federal Ministry of Health, 60 % skilled birth attendance by 2015 (FMoH, 2006) seems to be unrealistic given the current 10 % skilled birth attendance unless innovative strategies are put in place urgently.

Unskilled birth attendance and maternal mortality are strongly correlated, as risks for mothers and their newborn are highest at the time of labour and delivery (2). Skilled care at birth, including emergency care for mothers and newborns, is critical to achieving Millennium Development Goals 4 and 5: about 2 million lives a year are lost to complications occurring during labor and childbirth (5). In other words, increased skilled birth attendance means less mortality; a 10 percent increase in skilled birth attendance corresponds to 5% reduction in maternal deaths (1). It is estimated that around 16%-33% of all maternal deaths may be avoided through the primary or secondary prevention of complications during delivery by skilled attendance (8).

Maternal mortality rate in Ethiopia is among the highest in the world with 676 deaths per 100,000 live births or 19,000 maternal deaths per year (9; 10) which is worse than the average maternal mortality for developing countries 290 per 100,000 births (11) and far from the MDG 5 target for the country, 350 per 100,000 live births (3). It is estimated that 342,900 maternal deaths occurred in 2008, and more than 50% of these deaths is contributed by six countries; Ethiopia being one of the countries (12). What is more alarming is that the mortality rate in Ethiopia has not improved since the last demographic and health survey in 2005 which was 673 per 100,000 live births, the current mortality being 676 per100000 live births (13).
What is the cause of the Problem?
The role of poverty as the main cause of multifaceted problems including maternal health can not be overemphasized as Ethiopia is one of the poorest and least developed countries in Africa. Besides a number of studies have pointed out various factors for the low level of skilled birth attendance in the country. And the factors can be classified into the following categories (4): i) Socio-cultural factors, ii) Economic accessibility and iii) Physical accessibility iv) Poor health care delivery.

Framing the problem
Health service access in general and skilled birth attendance in particular face barriers from both the demand-side and the supply-side. However, little attention is given to demand-side barriers of health access either by policy makers and researchers. These demand-side barriers could be more important to poor communities as they already suffer from lack of information, traditional barriers and poverty (14).

Since the socio-cultural barriers, among others, have led to the underutilization of maternal services even what is available (15): the delivery of interventions to women according to their local needs ought to be the policy of all countries (12).

Though the other factors like level of education, distance to a health facility, poverty etc are important causes of the problem of low level of skilled birth attendance in Ethiopia they will only change only when the country grows hence are not subjects of this policy brief.

This evidence brief will therefore give emphasis to options which address the factors which prohibit mothers from utilizing health facilities during child birth; namely: The socio-cultural factors and care delivery problems which are summarized below:

- Wrong perceptions or attitudes towards facility birth: facility birth is not necessary or customary
- Preference to give birth among families
- Preference to give birth on a kneeling position
- Preference to give among relatives and friends
- Traditional practices during child birth which are absent in health facilities
- Unwelcoming attitude of care givers
- Lack of maternal waiting rooms and maternal and child friendly health facilities

Policy options for addressing low level of skilled birth attendance in Ethiopia

One of the targets of the Federal Ministry of Health for 2015 is to increase the proportion of skilled birth attendance (at home or facility) to 60% (16), six fold of the present figure.

Achieving this target in two years time needs integrated and innovative approaches which address the socio-cultural and care delivery barriers in the country. Four options addressing both demand and supply side problems are proposed.

Option1. Altering the environment of health facility delivery units to better suit mothers’ personal and cultural needs

Child birth in different communities is associated with different practices which are deeply rooted in the cultures and traditions of the community. These traditional practices during child birth are not available in health facilities. Hence, availing these traditional practices in a health facilities are likely to encourage women to give birth in health facilities. This could include allowing families to accompany mothers to delivery unit, bringing cultural practices into the delivery unit etc.
Option 2: Providing incentives (financial or otherwise) to each mother giving birth at a health facility

This option is meant to address both problems of physical and economic accessibility for a health care. Reimbursing transport costs through the use of transport vouchers, providing closes to the newborn and financial incentives to mothers etc.

Option 3: Building maternal waiting rooms at health facilities

This option aims at helping mothers who present themselves with early labour at health facilities. Maternal waiting rooms could help retain mothers at a health facility till true labour starts.

Option 4: Community mobilization and education on the importance of skilled birth attendance to mothers

This is an additional option to address the underlying socio-cultural factors. The strategies in this option can include: Pregnant women conferences, mobilizing traditional social institutions such as Edir, Churches, Mosques, Traditional Chiefs, Women’s Youth Leagues, and Health Development Armies etc.

References

Anaemia is a global public health problem affecting two billion people worldwide [1]. Globally, 41.8% of pregnant women and 30.2% of non-pregnant women are anaemic [1, 2]. Though anaemia has multifaceted causes, half of its burden is attributable to Iron Deficiency [2].

Many studies documented the adverse effects of maternal anaemia [3]. According to WHO 12.8% and 3.7% of maternal mortality in Asia and Africa respectively is directly attributable to anaemia [4]. Further iron deficiency is an underlying cause for 22% of maternal death worldwide [5].

A meta-analysis showed that the risk of maternal mortality can be reduced by 20% for each 1g/dl increase in haemoglobin concentration [5]. Other recognized consequences of maternal anaemia include risks of prematurity and low birth weight [3, 6].

In Ethiopia reasonable number of studies witnessed the public health significance of maternal anaemia [7-9]. The National Nutrition Strategy also adopted the key target of increasing the proportion of mothers who get IFS for more than 90 days during pregnancy and the post-partum period to 50% by 2015 [9]. There exist remarkable discrepancy between the ANC coverage and the IFA intake level. The 2011 DHS documented ANC coverage of 44% while the IFA is 17%. More importantly the IFA intake 90 or more tablets found to be 0.4% [8].

Background: Prenatal Iron Folate Supplementation (IFS) has paramount contribution for reducing maternal mortality. Nevertheless, in Ethiopia its coverage and compliance are disappointing as only 17.3% of pregnant women are taking the supplement and only 0.4% consumes it for the recommended 90 or more days [8].

Objective: To determine the coverage of and adherence to prenatal IFS and to identify factors affecting utilization of the service.

Methods: The formative research was conducted from Feb 21 to Mar 7, 2012 in eight selected Community Based Nutrition (CBN) implementing woredas which are relatively accessible woredas, in four regions. In general it had four main components;

a. Survey among women who gave birth in the preceding year of the survey targeted at determining the coverage and adherence of IFS;

b. A mini-survey among pregnant women intended to assess the magnitude of anaemia;

c. Qualitative study which comprised In-depth Interviews and Focus Group Discussions aimed at identifying factors affecting utilization of IFS; and

d. Exit interview and observation of ANC planned to evaluate the...
A. Results from the household survey

Quantitative data were collected from 1617 women who gave birth in the preceding year of the survey. Of the total respondents 91.4% had ever heard of ANC service. About 85% women interviewed believe that healthy pregnant women should attend ANC and above 95% agreed that ANC promotes maternal and foetal wellbeing. Only few women (2.5%) claimed ANC should be initiated right after conception whereas 41.8% said it should be started during the first trimester.

Among women who gave birth in the preceding year, 40.1% took iron tablets during the pregnancy. However, only 3.6% of them took the supplement for 90 or more days. On average, women start the supplement at the middle of the fifth month of pregnancy. Even though 96.9% women were informed about the dose (frequency and duration) of the supplement, merely 5.3% were told about the possible side effects of IFS.

Among 335 women who took iron supplement during the recent pregnancy, the majority (91.2%) reported that they were taking the supplement on daily basis, 1.1% used to miss 1 or more tablets per week, 4.4% stopped taking the tablet and 0.3% did not take any. The major reasons for non-adherence of stopping the drug were failure to get adequate supply for the health institutions (61.7%), occurrence of side effects (20%), forgetfulness (15%), and fear of side effects (1.3%).

The peak period for ANC booking was the third and initiation of iron supplements was six months of pregnancy (Figure2).

There is also remarkable difference between ANC and IFS coverage. Sankura woreda is seen to have the highest ANC and IFS coverage. However, high ANC coverage doesn’t guarantee high IFA coverage by itself. This discrepancy can be noted from coverage in Miskan woreda.

<table>
<thead>
<tr>
<th>Woreda</th>
<th>ANC coverage (%)</th>
<th>The trimester ANC was initiated (%)</th>
<th>Number of ANC visits (%)</th>
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</tr>
<tr>
<td>Sankura</td>
<td>87.0</td>
<td>42</td>
<td>58</td>
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Table 2: ANC coverage and utilization in eight selected study woredas, March 2012.
As the number of ANC visits increased the number of iron tablets mother consumed also increased. None of those women who had only one ANC visit consumed more than 60 iron tablets. However, 17% women who have had more than four ANC attendances consumed more than 90 tablets (see figure 4).

**B. Results of the mini-survey**

In order to assess the prevalence of anaemia, 414 pre women were randomly selected from the study wore- das. The haemoglobin concentration was 11.5 (±1.6) g/dl. In overall, the weighted prevalence of any form of anaemia was 33.2% and the prevalence of mild, moderate and severe anaemia were 18.8%, 13.6% and 0.8%, respectively.

Of the total respondents recruited for the anaemia study, 38.5% reported that they have taken iron tablets at least once during the pregnancy. At the time of the blood sample collection 8.9%, 12.6% and 6.1% of the pregnant women have already taken the iron tablets for 1-29, 30-59 and 60-89 days, respectively. Only 7.4% took the supplement for 90 or more days.

A significant increment in haemoglobin concentration was observed among women who were iron supplemented for more than 90 days.

Among iron supplemented study participants, the haemoglobin level amongst women who took the supplement for less than 30 days, 30-59 days and 60-89 days were 11.1 (±1.2), 11.4 (±1.8) and 11.8 (±1.5) g/dl, respectively. Pregnant women who took the supplement for 90 or more days had 12.4 (1.5) g/dl haemoglobin concentration.
C. Results from the exit interview and Observations

Across the study eight woredas 48 exit interviews among 48 ANC clients with the primary goal of evaluating the quality of the service and 48 observations were conducted.

- Of the 48 women interviewed, 67% were either prescribed or given iron tablets; 94% were not told about the side effects of the drug and only 9% knew that they are supposed to take the supplement throughout the pregnancy.
- About 85% were informed about follow-up visits.
- Client-provider interaction was unsatisfactory as only 46% of women who had physical examination were informed about the procedure ahead and 53% were told the findings of the procedure.

- About 60%, 40% and 30% received advice on personal care and nutrition, dangerous signs of pregnancy and importance of exclusive breast feeding, respectively
- Of 48 observations in 46% of the cases, service providers reviewed client medical records. Among illegible women 88% received abdominal examination.
- Even though it is abandoned, height measurement was taken and recorded in 63% of the observations.
- It was observed that 64% women were given IFS. Among those who were given the iron tablets, 56% were not informed about the importance of the tablets and 48% did not get clear explanations on how and when to take the tablets. In addition only 36% were advised to adhere. Among women who were taking the tablet before, only 32% were inquired about their compliance.
- The availability of IFA stock largely varies across the woredas and health institutions. The logistic system of IFS lacks clarity. In most of the cases the available stock is divided to health institutions without considering their need and there is no prediction of demand. Nearly all the woredas don’t have lucidly stated schedule for supplying IFS to health institution.

Conclusion and recommendation

From service delivery perspective, factors hindering the utilization of IFS service were lack of adequate stock and poor logistic system of IFA, poor quality of ANC, limited availability of HEWs at the health posts, lack of training for front line health workers on ANC, lack of BCC and job aid materials, poor counselling skill of health workers and limited knowledge of health professionals on the exiting national guideline.
From recipient perspective, factors hindering the utilization were minimal sense of vulnerability to pregnancy complications, late initiation and few ANC follow-ups, lack of physical access to health facilities, fear of side effects of IFS, underestimation of ANC service offered at health posts, rare misconceptions about IFS and shallow knowledge on the cause and prevention of anaemia.

1. Improve the coverage, quality and comprehensiveness of ANC service
   ◆ knowledge and skill the service providers & supervisors
   ◆ Avail the national standard on prenatal IFS at each HFs
   ◆ Avail IEC/BCC and job aid materials
   ◆ Introducing IFS compliance promotion and monitoring strategies
   ◆ provide training to improve the counseling and negotiation skill
2. Improve the accessibility of routine prenatal IFS
   ◆ alternative community based delivery mechanisms
3. Improve service delivery - the days the ANC service would be available at the health post
4. Improve social mobilization & the capacity of the vCHWs – to recruit, refer, educate & convince
5. Improve supply management
6. Advocate for the inclusion of IFA supplementation into the HEW supervisors and woreda Health office planning and monitoring formats.
7. Strengthen the quality of integrated supportive supervision at woreda level.
8. Improve women’s awareness on
   ◆ the merits of ANC services, maternal anemia and its consequences and
   ◆ taking IFA tablets during pregnancy through health education and communication services.

References
Introduction

Rabies is a public health problem, approximately 50,000 humans worldwide die from the disease annually(1, 2). Most of the persons at risk live in 90 countries with a population of 2.4 billion, where the rabies reservoir is the dog. In these areas, more than 95 percent of human rabies cases are transmitted by dogs(3). In Ethiopia, 94.01 percent of rabies cases are caused due to the bite of rabid dogs and the rest cases incriminate domestic and wild animals(4). Consequently, vaccination of dogs considerably reduces the risk to human, as has been shown in Europe and the USA(5).

Since the first rabies vaccination in 1885 by Louis Pasteur, significant progress has been made in improving the pre and post-exposure treatment of human rabies(3). Several types of anti-rabies vaccines are used for pre and post exposure treatment, which include live attenuated which is live virus after several passage, inactivated (killed), DNA-based and vector vaccines.

For the production of anti-rabies vaccines, a number of attenuated vaccine strains are employed. These are Pasteur Virus (PV), Evelyn RokitnikiiAbelseth (ERA), Street-Alabama-Dufferin (SAD), 3aG, Pitman Moore (PM), and Flury strains(6). PV strain is one of the first vaccine strains, which was isolated from a rabid cow in 1882 and attenuated by multiple passages in rabbit brain. The SAD strain was isolated from a rabid dog in Alabama (USA) in 1935 and adapted for cultivation on the mouse brain and on the baby hamster kidney cell culture (BHK) (7). Although the need for evaluating the immunizing potencies of rabies vaccines has been recognized since the early Pasteur days and practical standardized tests have been available and in use for over 20 years, many laboratories that produce the vaccines did not practice routine test on the potency of their products(6).

Following a standard vaccine production procedure alone does not necessarily assure production of vaccines with consistently satisfactory potency levels. There are three important considerations in assessing any potency test of rabies vaccines. First, the test procedure should actually evaluate the property of the vaccine that determines its effectiveness in the prophylaxis of rabies in human or animals. Using a naturally susceptible host, the ideal test would simulate conditions of natural exposure and usual prophylactic treatment(2). This would mean the use of street virus introduced through a bite-wound, followed by daily doses of vaccine in the case of those vaccines intended for human use. This has, of course, been found to be impracticable, as have most types of test where administration of vaccine is started after experimental exposure of the test animal. Most tests, therefore, involve multiple doses of vaccine (as administered in human) followed by subsequent challenge with fixed virus given intracerebrally, as being a more easily standardized type of challenge. While far from reproducing the situation with natural exposure and the standard schedule of vaccine administration, this type of test has been shown to reflect fairly closely the ability of a vaccine to protect under natural conditions(8). Secondly, not all laboratories can obtain large numbers of experimental animals easily, nor they could repeat tests when animal costs are high. The time factor is important, since newly prepared vaccine must be held until potency tests are complete and the time required for this has to be deducted from its period of effectiveness(2). The third requirement is for standardization of the test procedure so that there will be comparability of results from one vaccine to another in a single laboratory and between different laboratories(6). The aim of this study to evaluate safety and potency of cell culture anti-rabies vaccine produced in Ethiopia by in vivo method on suckling mice.
Materials and Methods

Experimental animals: Ten to sixteen weight, 2 weeks of age suckling mice with identical sex were used for both safety and potency test.

Inactivation: the viral suspension was thawed and centrifuged at 5000rpm for 15 minute to remove cell debris. Formalin inactivation was performed by using concentration of 1:5000 vol/vol, formalin and incubating at 37°C for 48 h, shaking twice a day.

Safety test: Presences of residual virus were investigated on three groups of mice, each group containing eight mice. The mice were inoculated with 30µl of test vaccine intra-cerebrally for each dilution and observed for 14 days for any sign of infection by rabies. Bacteriological test was performed by incubating test vaccine in thioglycolate media for 48 hours.

Potency test: Potency test was performed using National Institutes of Health (NIH) test. Mice were immunized at day 0 and 7 with 500µl of both test and reference vaccine intra-peritoneal. Five different concentrations of test vaccine (1:5, 1:25, 1:125, 1:625 and 1:3125) and four different concentrations of reference vaccine (1:10, 1:50, 1:250 and 1:1250), 16 mice in each dilution were used. The control vaccine used was VeroRab vaccine which was produced by Sanofi Pasteur. This vaccine was converted to 1IU before preparing working dilution for immunization. Forty mice were kept separately from immunized group to be used as control.

Challenge test: Standard challenge virus strain (CVS-11), which was obtained from CDC Atlanta was used for challenging. All mice; test, reference and control group were challenged on 14th day of immunization with challenge virus strain (CVS-11) of 25 MLDis/0.03ml. The mice were observed for 14 days after challenge. Any mouse that died within five days after challenge was recorded as non specific death. Mice that died after fifth day of challenging without showing sign of rabies tested by fluorescent antibody test (FAT) for presence of any detectable rabies virus on the brain sample. All specific and non specific deaths were recorded separately.

Data analysis

Data analysis was performed using NIH formula to calculate potency of crude vaccine. The recorded number of mice that died and survived was used to estimate relative potency (RP). The potency was calculated using the number of mice that survived and mice died with specific death and non specific death, which was recorded separately after 14 days of challenging.

A volumetric method of calculation of potency, compares the 50% end-point dilution (vaccine dilution protecting 50% of mice) of the vaccine under test with that of the standard (commercial vaccine diluted to a final potency of 1IU/ml). The relative potency (RP) of the vaccine under test is determined by the formula:

\[ RP = \frac{\text{reciprocal of ED50 of TV}}{\text{reciprocal of ED50 of RV}} \times \frac{\text{dose of TV}}{\text{dose of RV}} \]

Result and Discussion

For the safety test, all mice survived the intracerebral inoculation with three different dilutions of the test vaccine. These mice were observed for 14 days after inoculation and no death recorded. This implies that the vaccine is completely inactivated and there is no residual virus present in the crude vaccine. Bacteriological safety test shows no growth of contaminant after inoculation of the crude vaccine on thioglycolate bacteriological media which guarantees the safety of the crude vaccine for this level of purification.

This table briefly explains the number of mice died from each group with differentiation between specific and non specific death. Control group included to evaluate the effect of virus on non vaccinated group.
The findings revealed that mice died from all dilutions but the number of mice died differs with in dilutions for both test and reference vaccines. As dilution step increased, the number of mice that died increased within each dilution except reference vaccine with two dilutions resulted in similar death and survival rate. Slight difference of potency result was obtained for both ERA and PV strain vaccines. Potency result shows relative potency of 8.32 IU/ml for ERA rabies vaccinal strain and relative potency of 3.56 IU/ml for PV rabies virus vaccinal strain. Based on WHO’s recommendation, both vaccines show potency result above the requirement which is greater than 2.5 IU/ml for single dose of immunization. ERA rabies virus strain showed high potency when compared to PV rabies virus strain. This can be expressed based on the virus titer before inactivation which can be $10^{6}$-$10^{8}$ TCID/ml and the virus genetic difference. Therefore, PV vaccinal strain produced vaccine can be used as it is, and ERA vaccinal strain based vaccine should be diluted up to the lower minimum potency requirement to use as single dose of vaccination.

**Conclusion**

The study showed that both ERA and PV vaccinal strain based vaccines are free from any residual virus left after inactivation and no bacterial contamination during the process of production. The ERA and PV strain vaccines were effective at 8.32 IU/ml and 2.56 IU/ml, respectively. These crude vaccines fulfill the potency and safety requirement of rabies vaccine based on WHO recommendation. The vaccines can therefore be used for animal immunization, but further purification is required to be used for human.

**Acknowledgement**

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**References**

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Mrs. Aregash published various publications which many are research related and she also contributed to many different articles, reports and surveys including National Baseline survey report of the National Nutrition Program (NNP) of Ethiopia (participated in tools development, editorial work and reviewing), Comprehensive sensory evaluation manual, Contributed to National Food Consumption Survey as national coordinator, Contributed to the “Laboratory and Field Investigational Reports on the illness reported from Yirgalem prison through Southern Nations and Nationalities and Peoples Region Health Bureau (SNNP-RHB)”, contributed to the project "Effective Modalities to Improve Pregnant Women Compliance to the Daily Prenatal Iron-Folic Acid (IFA) Supplementation” as Principal Investigator. She is also a coordinating a study entitled as ” Assessing multi-sector coordination for nutrition policy effectiveness: analysis of facilitators, constraints and solutions for effective implementation”. Mrs. Aregash also has some teaching experience as she taught in Shambu high school in Wollega for grade 9 and 10 and was also a lecturer in Kotebe College of Education.

Mrs. Aregash appeared on ETV’s weekly health program and explained about Ethiopian holiday diet positive and negative effects and diets during pregnancy. She also participated in the online discussion about healthy eating during pregnancy, diet for children and for diabetic people which was hosted by the Ethiopian Radio and Television Agency. Mrs. Aregash is currently working as the director of the Food Science and Nutrition Research Directorate (FSNRD) inside the Ethiopian Health and Nutrition Research Institute (EHNRI) and she has got admission to PhD program in Human Nutrition at Wageningen University of The Netherlands and obtained a NUFFIC scholarship to pursue her study.
Vision and Mission of EHNRI

Vision:
To see healthy, productive and prosperous Ethiopians.

Mission
To protect and promote the health of the Ethiopian people by addressing priority public health and nutrition problems through problem-solving research, public health emergency management, establishing and maintaining quality laboratory system.

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