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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing Escherichia coli in the Calgary Health Region: emergence of CTX-M-15-producing isolates. Antimicrob. Agents Chemother. 51: 1281-1286.

Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

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# Journal of Public Health and Epidemiology

## ARTICLES

### Research Articles

*Full Length Research Paper*

# Psychosocial wellbeing of orphan and vulnerable children at orphanages in Gondar Town, North West Ethiopia

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**The aim of this study was to explore the psychosocial problems and coping strategies of orphan and vulnerable children living in two orphanages, namely Yenege Tesfa and Bridge of Hope Ethiopia orphan and vulnerable children care and support centers in Gondar town, North West Ethiopia. The research primarily used a phenomenological study design of the qualitative method. Qualitative data was collected from 1 March to 31 May, 2014, by using in-depth interview and focus group discussion techniques. The data were analyzed thematically using Nvivo 8 statistical software. A total of 20 in-depth interviews and 4 focus group discussion (FGD) sessions were carried out. The study revealed that orphan and vulnerable children in the orphanages accessed all the basic services necessary to sustain their lives. Conversely, the study also revealed that the children suffered from a set of multidimensional and intertwined psychosocial problems that were the least addressed in the orphanages. Thus, interventions to promote the psychosocial wellbeing of the children should focus on addressing psychological problems, advancing socialization skills, organizing extracurricular activities and entertainments, and improving coping strategies.**

**Key words:** Psychosocial wellbeing, orphan and vulnerable children, orphanages, coping strategies.

## INTRODUCTION

Recent estimates report that there are approximately 145 million children worldwide who have lost at least one parent as a result of various causes (World Health Organization/United States Agency for International Development, 2008). Since 1990, the number of orphans from all causes has decreased in Asia, Latin America and the Caribbean, but has risen by 50% in sub-Saharan Africa (United Nations Children's Fund, 2006). With the

second largest population in Africa, Ethiopia has been distinct by having the second highest population of orphan and vulnerable children (OVC). Like many other African countries, Ethiopia will continue to see increasing numbers of OVC in the future. Extreme poverty, conflict, exploitation, drought, famine, living on the street, disease and the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) pandemic are

having a devastating impact on the country's youngest and most vulnerable citizens. The effects have placed an overwhelming burden on children, families, communities and the country as a whole (United Nations Children's Fund, 2007).

Children's psychosocial wellbeing affects every aspect of their lives, from their ability to learn, to be healthy, to play, to be productive and to relate well to other people as they grow (Atwine et al., 2005; Cluver et al., 2008; Killian and Durrheim, 2008; Makame et al., 2002; Zhao et al., 2007). When children lose one or both of their parent(s) due to any cause, they experience multiple psychosocial problems, like grief, hopelessness, anxiety, stigmatization, physical and mental violence, labor abuse, lack of community support, lack of parental love, withdrawal from society as a whole, feelings of guilt, depression, aggression, as well as eating, sleeping and learning disturbances (Gilborn et al., 2001; Chipungu and Bent-Goodley , 2004). The traumatic effects of parental loss can also have further negative psychological effects on behavior, emotions and thoughts (Calhoun and Tedeschi, 1995). Psychological distress is expressed in varied ways. Some children take to living on the streets and commit various forms of juvenile crimes as a coping strategy (Gow and Desmond, 2002). Children may also become exposed to alcohol and drugs and use them as a way of shutting out painful effects (Calhoun and Tedeschi, 1995).

According to the Standard Service Delivery Guideline for OVC Care and Support Programs of Ethiopia, there are seven core service components, including shelter and care, economic strengthening, legal protection, health care, psychosocial support, education and food and nutrition (Federal HIV/AIDS Prevention and Control Office (FHAPCO), 2010). However, the psychosocial needs of OVC are neglected or overlooked by the service providers. In Ethiopia, children in difficult circumstances face many psychosocial problems due to the death or separation of their parents (FHAPCO, 2007). Discussion with officials of FHAPCO, Addis Ababa HIV/AIDS Prevention and Control Office, Addis Ababa Women, Children and Youth Affairs Bureau, and the Ministry of Women, Children and Youth Affairs and other reports show that OVC are suffering from psychosocial problems, like distress, anxiety and emotional disturbance. Among the surveyed children in Ethiopia, less than half of the OVC in some districts of the country were receiving psychosocial support services, like counseling, the overall achievement of which has been unsatisfactory, given the extent of exposure to psychosocial problems (World Vision UK, 2011).

The society, governmental, non-governmental, faith-based, and community-based organizations inherit the role of guardian to the OVC, and have to meet huge challenges when attempting to ensure the psychosocial wellbeing of these children (Manuel, 2002; Ferreira et al., 2001; Loening, 2002; Davids, 2006; Abebe and Aase, 2007). Although these institutions are willing to assume guardian-roles, efficiently addressing the psychosocial wellbeing of the OVC without clearly understanding their psychosocial needs and the coping strategies is impossible. Despite the rapidly growing burden of OVC in Ethiopia, psychosocial problems and the coping strategies of these children in orphanages are not well researched. Moreover, the service delivery by service providers to fulfill OVC needs and respect their rights should be evidence-based and inculcate the best interest of the children. Thus, the inner voices of abandoned children should be heard and understood. The findings may help aid agencies, government departments, and society in general on the path to a better understanding of the support needed to attain desirable levels of psychosocial wellbeing.

## METHODOLOGY

### Study design

A phenomenological study design of the qualitative method was used. Phenomenological research is a type of approach in which the researcher identifies the essence of human experiences concerning a phenomenon as described by participants in a study. Understanding lived experiences marks phenomenology as a philosophy as well as a method, and the procedure involves studying a small number of subjects through extensive and prolonged engagement to develop patterns and relationships of meaning. In this process, the researcher brackets his or her own experiences in order to understand those of the participants in the study (Creswell 2003). Cognizant of this fact, the approach was chosen as a relevant design to examine the subjective feelings, experiences and options of OVC about their psychosocial wellbeing in this study.

### Study area

The study was conducted at two orphanages, namely Yenege Tesfa and Bridge of Hope Ethiopia in Gondar town, North West Ethiopia. The town is located at 745 km North West of Addis Ababa, the capital city of Ethiopia. It is the fifth largest town with an estimated population of 265,000 (Ethiopian Central Statistical Agency, 2013). Since the last decade, there has been a rapid population movement from the surrounding areas to the town in search of jobs. There were an estimated 4,400 OVC living in Gondar; over 800 of them sleep on the street every night (Yenege, 2014).

The admission of children takes place through legal and formal processes in order to find better options for the child before she/he joins to the orphanages. The procedure is started from local Kebele office initiated by the guardian or by any interested and responsible person or organization. After the local Kebele court has accepted the certainty of the fact with affidavit, it transfers the application for further resolution to Zonal or District Women, Children and Youth Affairs offices. The Women, Children and Youth Affairs Office forms screening a team, including the orphanage as a member, and the team jointly scrutinizing the severity of the problem and the existing conditions of a child on the spot will reach a decision.

Care and management of the children has been undertaken in family-like houses separately for boys and girls. Each family has 15 to 19 members of children (the size of a traditional Ethiopian family) which consist of all age groups from 1 to 17 years. The family is run by a group comprising a mother, a father model, and a big sibling

who act as the primary guardians for all children. Cultural and social norms which could impair the psychosocial wellbeing of the OVC are practiced in the area. For instance, the cultural norm to avoid discussion with children about the death of their parent(s) is common and can complicate the bereavement process. As it is true to other African cultures, the expectations to keep silent and internalize emotions during hard times are also common cultural attributes in the society (Wood et al., 2006). In addition, the OVC are often adopted into extended families that could not support them, leading to greater risk of psychosocial harm.

**Study population**

The study population was the OVC living in Yenege Tesfa and Bridge of Hope Ethiopia orphanages. The children who were 10 to 17 years old lived for at least a year in the orphanages, and were active beneficiaries of the services at the time of the research were considered for sample selection, whereas children who were not willing to participate in the study were excluded from the study.

**Sample size**

The sample size of the study was decided when redundancy or saturation of information was reached. A total of 20 in-depth interviews were conducted with 6 female and 6 male OVC and 8 caregivers.

**Sampling procedures**

An official letter from the University of Gondar via the School of Sociology and Social Work was submitted to Yenege Tesfa and Bridge of Hope Ethiopia orphanages to get permission for the study. A copy of the letter was kept to show any concerned body and participants. The researcher used the homogenous sampling type of the purposive sampling technique to reach children rich in psychosocial information. To meet the participants who were knowledgeable in the study topic, the OVC who attended care and support in the orphanages for more than a year were selected. Children who were interactive enough were consulted to ensure the quality of the data. The purpose of the study and the eligibility criteria to participate in the study were explained briefly to the organization heads, program managers, and counselors to get in touch with the OVC who fulfill the criteria to participate in the study. The researcher further explained the whole purpose of the study to children who volunteered to participate in the study. Legal guardians of the OVC were contacted and briefed. After obtaining full approval from the orphanage officials to conduct the study, the children and their guardians, convenient date, time, and place of meeting were set based on their preferences.

**Data collection procedures**

The data collection took place from 1 March to 31 May, 2014. The data were collected by the principal investigator who entertained the subjective feelings and experiences of the OVC that helped him in the data analyses. The researcher spent nine years of his youth in Gondar town and speaks Amharic fluently, and has knowledge and experience of the local culture. He had an assistant data collector for the FGDs. In addition to his public health educational background, he had training on qualitative data collection tools, procedures and communication skills to keep the children comfortable. The researcher used a semi-structured interview guideline for both the in-depth interviews and the FGDs. The guide questions were prepared in Amharic to make them easily

understandable to the participants and to avoid the interruption of discussion flow owing to translation problems. The FGDs and in-depth interviews were also conducted in Amharic, the local language of the participants.

A pilot investigation was conducted with the OVC who had characteristics nearly similar to OVC in the orphanages in order to identify potential problem areas, unanticipated interpretations, and cultural objections to any of the questions. By learning from the pilot investigation, the guide questions were modified to make them understandable to the participants, and interview length was decided. The in-depth interviews and FGDs were conducted in the spare time of the children. The convenient time for the participants was when they returned from school between 3:00 and 5:00 pm and weekends. These activities also took place in the same orphanages, particularly in the playing room (when nonparticipants were out) in order to safeguard the convenience and privacy of the participants. In addition, apart from the FGDs and in-depth interviews, field notes were taken during interviews and discussions took place to capture emotions expressed verbally or non-verbally. Both the in-depth interviews and FGDs were audio-taped, each of which took about an hour. The ongoing analyses started as early as data collection in order to make it flexible to include the missing voices of the study participants. The data obtained in audio or textually were kept in a secured place for data audit.

**In-depth interview**

The researcher used an in-depth interview primarily to collect authentic data. In order to understand the in-depth experiences of the OVC, interview was an appropriate tool as the OVC experience sensitive issues which would be difficult to discuss in a group settings. Thus, they described their individual experiences and gave unique interpretations to experiences through the individual in-depth interview. An audiotape recorder was used to tape-record the interviews in order to catch the details that even the most careful field notes could not. This enabled the researcher to replay each recording several times, improving the veracity of the verbatim transcriptions. In addition, non-verbal clues were observed during the interview process, and the interviewer used probes in order to elicit a deeper understanding necessary for this study because probing encouraged a respondent to produce more information on a particular topic without the interviewer injecting his own ideas into the discussion. In the process of interviewing, an emotionally supportive environment was created to help the participants feel comfortable to participate in the interview and minimize the power balance. Rapport was developed with the participants. The in-depth interview data from the OVC were enriched by triangulating the interview with the caregivers. A total of 20 in-depth interviews were conducted with 6 female and 6 male OVC and 8 caregivers.

**Focus group discussion**

The study also used FGD as a data collection method to ensure data quality and triangulate the methods. The FGD ensured the breadth of the data since many participants discussed a specific research topic from different views. Both sexes of the OVC who fulfilled the inclusion criteria sat for discussion. Four FGDs were conducted for the two categories based on gender. A decision to separate male from female was carried out since children may find some issues difficult to discuss in front of opposite sexes. Thus, two FGDs with female OVC and two with male OVC were conducted. A group was composed of 10 children. By building a relationship of trust with the study participants, the researcher created an environment that encouraged all participants to communicate their subjective feelings and the psychosocial experiences they faced and the coping strategies they were using. Besides, to get full views

from the discussants, efforts were made to control dominant speakers so others were encouraged to reflect their experiences on the issues raised.

## Data analyses techniques

The researcher transcribed the audiotapes on the same day as the completion of the interviews and FGDs to enable him to capture the observations of the non-verbal points by linking the audio recorded interviews, field notes, and the researcher's memory of the event. Field notes contained information that was observed by the researcher during the interviews and discussions. Non-verbal clues for each participant were recorded as separate field notes without interfering with the conversation, and the notes were clearly marked with the identification number of the research participant. Transcriptions were made in an undisturbed environment. The researcher embarked on the following steps: (1) Each recorded interview was downloaded using the Olympus Digital Wave Program into the researcher's laptop. Only the researcher had access to the downloaded interviews; they were secured with an access code. (2) Each folder was allocated a unique file name containing the date of the interview for identification purposes. (3) Recorded interviews were downloaded to disks, creating a backup copy. (4) A verbatim translation of the transcripts from Amharic into English was done by the researcher. The translation was checked by listening to the recorded interviews and discussions, again whilst reading the computer files. (5) After completing the transcriptions, copies of the transcripts and downloaded disks were locked up to ensure confidentiality.

The researcher immersed himself into the data by repeatedly hearing the audios and reading the transcribed and translated notes. He used the Nvivo 8 qualitative data analysis computer software package to reduce and analyze the data. The translated data were open coded. The coding of the data was started immediately after the translation of the data to avoid memory loss. The coded data were further coded, grouped and categorized. That means, the codes with similar characteristics were grouped together thematically. Interpretation followed instantaneously after the analyses. The researcher provided interpretation based on the findings to increase the transferability of the study to other contexts. In addition, cases were drawn from the interviews and discussed to explain specific stories in detail. The preliminary findings were presented to colleagues to receive input and comments. The transcribed and translated notes were labeled by using the identification number, date and place of interview, and the FGDs to make a back connection at any time when the researcher is in need. Similarly, data which show the process, records, documents and findings were kept for audit trial.

## Ethical considerations

First, the study protocol was reviewed and approved by the Institutional Ethical Review Board of the University of Gondar via the School of Sociology and Social Work. Permission was obtained from the offices of Yenege Tesfa and Bridge of Hope Ethiopia orphanages. Written assent was obtained from children 15 to 17 years of age since they were a minor consenting group. For those below the age of 14 years, written consent was obtained from legal guardians in the absence of their families, whereas oral assent was obtained from the children. The objective of the study was clearly communicated in a language the study participants could understand. In addition, the rights of the study participants to withdraw from the study at any time were safeguarded. At the same time, the potential benefits and risks of participating in the study were explained to the study participants. To avoid intrusive interview for the child, the researcher established good rapport and

used qualitative interview techniques, and the assistant data collector was trained. The anonymity of participants and the confidentiality of the information were maintained throughout the study by using pseudo identifications and removing personal identifiers for the participants. All recorded and written data were kept in a secured place and that was explained to the study participants prior to interviews and FGDs. The computer used for the data retrieval and analyses had only one entry and a protected password. Throughout the study, starting from the research proposal presentation to the dissemination of results, all ethical issues were considered and maintained.

## Definition of terms

### Orphan child

This is a child who is less than 18 years old and has lost one or both parents regardless of the cause of the loss (FHAPCO, 2010).

### Vulnerable child

This is a child who is less than 18 years of age and whose survival, care, and protection or development might have been jeopardized due to a particular condition, and who is found in a situation that precludes the fulfillment of his or her rights lost (FHAPCO, 2010).

### Orphanages

These are institutions where OVC get care and support.

### Psychosocial wellbeing

This is the physical, emotional, mental, social and spiritual development of the OVC in orphanages (Gilborn et al., 2001; Makame et al., 2002).

### Psychosocial support

This is an ongoing process of meeting physical, emotional, social, mental, and spiritual needs of a child all of which are essential elements for meaningful and positive human development (Gilborn et al., 2006).

## RESULTS

## Sociodemographic characteristics of the study participants

From a total of 60 participants involved in the study, 52 of whom were OVC living in the orphanages, twenty-six of them were males. Majority of the children belonged to the age group of 15 to 17 years. Regarding educational status, 37 of the children were attending primary schools. Most of the children had lost their parent(s) by death and some did not know their parent(s) as they died during their early age. Three male and 5 female caregivers involved in the in-depth interview (Table 1). The following overarching psychosocial experiences of the OVC in orphanages emerged from the thematic analysis of the qualitative data.

**Table 1.** Sociodemographic characteristics of study participants at Bridge of Hope Ethiopia and Yenege Tesfa orphanages in Gondar town, North West Ethiopia, 2014.

| Characteristics | Number of participants |
|---|---|
| **Sex of children** | |
| Male | 26 |
| Female | 26 |
| | |
| **Age of children** | |
| 10-14 | 13 |
| 15-17 | 39 |
| | |
| **Educational status of children** | |
| Primary | 37 |
| Secondary | 15 |
| | |
| **Lost parent(s)** | |
| Yes | 42 |
| No | 10 |
| | |
| **Sex of caregivers** | |
| Male | 3 |
| Female | 5 |
| | |
| **Age of caregivers** | |
| 25-35 | 3 |
| ≥36 | 5 |
| | |
| **Marital status of caregivers** | |
| Married | 6 |
| Single | 2 |

**Theme one: Provision of basic needs**

Most of the children reported that they felt so happy and led better life than before due to the basic services they received at the orphanages. They witnessed that they were able to access basic needs, such as food, clothing, shelter, medical care and education. A 15 year old double orphaned boy who served for 9 years in the orphanage expressed his feeling by stating:

*"I feel good living here because we can now afford to have all the basic needs that we didn't have while in the village or on street... I feel blessed because I never had a dream to lead such a good life."*

In contrast, a few of the children stated that they were not leading a happy life. They complained that the services they received were of poor quality. A 16 year old single orphaned girl who lived for 4 years in the orphanage expressed the condition by saying:

*"The food is usually salty; the cloths are not smart and fit to wear… If I get any    opportunity to leave this orphanage, I will never hesitate. For me, it is like a prison."*

**Theme two: Psychological problems**

*Stress and depression*

The study revealed that the majority of the children felt sad, depressed, and in stress due to lack of good relationship with service providers and the community, and due to grief and bereavement of their parental loss. A 16 year old girl who lost her mother expressed her grief by saying:

*"It has been seven years since I lost my mom by death unexpectedly. Immediately after her death, I entered a new world of calamity full of sadness and stress. My father is alcoholist and has never opened his hand for me…"*

In contrast, a 15 year old double orphaned boy who served for 5 years in the orphanage expressed the condition by stating:

*"Before I joined this orphanage, I usually felt depression and stress due to lack of what   to eat, to dress…Now here is there is no problem. I am very happy with this life."*

*Loneliness*

Most of the participants during the FGDs reflected that they experienced feelings of loneliness during their stay in the orphanage due to poor relationship with the staff, particularly caregivers, lack of love from the community, and memory of parental death. They felt as if they were ignored and nobody took care of them, according to a 17 year old double orphaned male child with HIV/AIDS who says:

*"…Children in these shelters including the caregivers and my classmates always ignore me as a dead body. Usually, I remember my mom's and dad's love and care for me which is a dream now…"*

*Lack of parental love*

In all the in-depth interviews and FGDs lack of parental love was shown to be the main problem of the OVC. The children reported that they suffered from stress, depression, and other emotional problems which were rooted in their lack of parental love from staff, particularly caregivers and the community. A 16 year old boy who lived for 5 years in the orphanage expressed the condition as:

*"…People in the community have no love for us. Instead, we observe when they hate, insult and laugh at us. I do not know their reason; they even do not like the existence of the orphanage."*

In field observations it was noted that the child-to-staff ratio was high. It was also observed that employees worked, cooked, rested, or socialized with other staff members, and not the children.

### Lack of sleeping

The majority of the children complained that they had a problem of sleeping. They pointed out that the problem was usually related with continuous stress as a result of poor relationship with staff, particularly caregivers, lack of success in education, and lack of parental love and care. In the in-depth interview, a 15 year old double orphaned girl expressed her sleeping condition by saying:

"*Usually I used to sleep for about four hours only at night. The problem becomes intensified when I score the least marks in my class tests. The other thing is the caregiver has no love for me…*"

In contrast, a few of the children stated that their problem was over sleeping. A 39 year old caregiver who had served for 9 years in the orphanage said that:

"*I usually advise some of the children not to oversleep. However, there is no change. This is their school performance…*"

### Poor concentration

The children reported that their problem of poor concentration was in one or another way related to other psychological maladies like stress, depression, anxiety, lack of sleeping and love, and memory of parental death. A 15-year old double orphaned girl explained her situation of poor concentration by stating:

"*I never focus. I am always moving, shuffling, shifting, or fidgeting. I procrastinate all the time. I can't go to sleep…It goes something like this*".

A 14 year old boy who lived for 7 years in the orphanage associated the problem to lack of physical exercise by saying:

"*We have nothing arranged for physical exercise. If we do physical exercise, our ability to focus increases…Finally, every one of us becomes successful.*"

### Lack of self confidence

The children reported that they had low self confidence to succeed in their life goals. They think that they could not have the desired inputs and capacities to achieve their goals confidently by comparing themselves with non-OVC in their schools. A 16 year old girl who lived for 7 years in the orphanage described her confidence as

follows:

"*…I do not assure myself. What makes me have no self-confidence is just because I have nothing. So I feel insecure. This affected my school performance since I usually fear to communicate with my classmates and my teachers …*"

In contrast to this, some of the children reported that they had no problem regarding their self-confidence. This was also witnessed to be true during the field observation where the children were highly interactive, and eager to understand their environment.

### Helplessness

In all the in-depth interviews and FGDs the children expressed their deep feelings of helplessness. The feeling stemmed from their fear of future survival as there was intermittent interruption and decrement in the flow of funds. As the result of this and other things, like lack of trust and love from people they, look at the future negatively. Some children wished if they were not born and felt that life was not worth living. A 15 year old boy with HIV/AIDS described his feeling as:

"*I lost my mom and dad in two consecutive years. Now, there is no one who bothers about me. I do no share my problems with anybody since I do not trust them. Moreover, the officials may fire me out if I make any mistake…The future is dark.*"

**Theme Three: Poor social interaction**

This study revealed that the OVC had poor social life and communication with the people around them. The majority of the discussants expressed that the difficulty was mainly related to the orphanages' rules of conduct, perception, lack of self-confidence, and social skills. A 15 years old double orphaned girl who lived for 12 year in the orphanage explained it as:

"*I do not know how to interact with people in the community. I have no confidence to talk and walk with them because I am an orphan. I go to school but I do not talk with my classmates…*"

Moreover, the majority of the children reported that they experienced verbal, physical and emotional abuse and neglect by the community and internal staff. It was more common for the children to claim that they were bullied and embarrassed by people in the community, solely based on the fact that they were OVC and lived in orphanages. A 16 year old boy described his feeling as follows:

"*If the orphanage workers consider us as their own children, they will not punish us with such a big stick that we can't tolerate. The worst of all is whenever they are informed that we quarreled with anybody in the community; they add the pain by punishing and giving us warnings of dismissals.*"

It was also noted that the majority of the children preferred to be socially isolated. They perceived that the community had bad attitude and lack of love for them. A caregiver substantiated this by saying:

"*The children have love for each other. However, this is not true for other people in the community including me. Most of them even never ask me when I feel sick and in bed for three and more days. When any people come from the community they hate and hide themselves…*"

Furthermore, except a few of children, the majority of them did not feel secured since they had no good interaction with their caregivers, other staff and outside community. One caregiver explained this by saying:

"*The children sometimes associate and go apart. Sometimes they want hugs and kisses, and later you can't touch them. They can't form strong bonds with people, and they avoid looking at others in the eye.*"

## Theme four: Lack of extracurricular activities and entertainments

Regarding extracurricular activities, the children complained that there was nothing effectively organized in the orphanages as a supplementary to the formal school education. Most of the children indicated that they wished to participate in games, such as football, netball, volleyball, spinning, and performing physical exercises. While others would be very happy if they were members of debating and drama clubs, and yet some said that they were longing for gardening as well as beekeeping as part of their extracurricular activities. One child stated that:

"*Every day after school, we have nothing to do and nowhere to go in our spare time. As the result of this most of us feel depressed. If there are activities organized to spend time, we will go for what each one of us enjoys most.*"

Field observations also revealed that children spent their spare time by wandering here and there around shelters without being engaged in any visible activities. Another issue that emerged from the children's daily life experiences at the orphanages was lack of entertainments. The children pointed out that they wished to enjoy playing the guitar or the piano, singing and dancing, listening to music, watching films, and reading newspapers.

## Theme five: Coping strategies

The children reported that they used different strategies to cope with their problems on a daily basis. The strategies are reported as follows.

### Praying and going to church

Most of the children reported praying and going to church as their coping strategies when they faced challenges. They said that they complained and shouted to God about the hardships and felt fresh after praying. Also they expressed that they spoke to God to protect them from dangers and to direct their future. A 17 year old boy said:

"*With God, what is possible is the impossible…Always life would be okay after praying and walking to church.*"

### Supporting each other

The majority of the children said that they developed a habit of supporting each other when they faced problems. They explained that they supported each other when they suffered from physical illness, when they quarreled with people in the community and in conflict with caregivers and other staff.  They reassured each other.

### Focusing on education

Almost all of the children believed that focusing on education and excelling at school could change their future life positively. They struggle to use their time effectively. This in turn helped them to suppress their bad feelings and to discount the current situation.

### Bury feelings internally and crying

The children explained that they did not have anybody who understood them and shared their problems. As a result, they preferred to bury the problems internally for themselves and to cry. A caregiver who served for 10 year in the orphanage witnessed this by saying:

"*Many times children sit down somewhere alone and cry, cry…They never tell me what is wrong with them. Most of them bury their feelings internally, except some.*"

### Self-discrimination

The children reported that  they  used  self  discrimination

as a good strategy to avoid discrimination in return for disclosing their secrets. Most children did not feel comfortable to share their private issues, stress, sadness and grief to staff. Even they didn't want to consult counselors because they did not think that they kept secrets confidentially.

## DISCUSSION

This study aimed to explore and possibly attained for an in-depth understanding of the psychosocial experiences of OVC living in orphanages. The study explored that children in the orphanages accessed all the basic services necessary to sustain their lives. They said that they were able to access basic needs, such as food, clothing, shelter, medical care and education, all of which they could not afford previously. They warmly appreciated the staff and the Government for providing them with such life changing services. Adequate provision of basic services to the OVC could enable them to develop resilience against challenges in their lives.

On the other hand, the present study also indicated that there were a set of multidimensional and intertwined psychosocial problems that were poorly addressed within the orphanages. Psychological problems were the main theme reported as deteriorating the wellbeing of the OVC in the orphanages. This and other studies corroborated that when children lose one or both of their parent(s) due to any cause, they experience multiple psychological problems, like stress, depression, anxiety, lack of parental love, lack of self-confidence, poor concentration, feelings of loneliness and helplessness as well as sleeping disturbances (Gilborn et al., 2001; Chipungu and Bent-Goodley, 2004; Calhoun and Tedeschi, 1995; Wolff and Fesseha, 1998; FHAPCO, 2007). There is thus an urgent need to revise the existing resilience model of the orphanages so as to protect the expansion of the problem among the children.

Being abandoned and loss of parental care have a devastating impact on children's social development (Crenshaw and Garbarino, 2007; Killian and Durrheim, 2008; Berry and Guthrie, 2003). This study also revealed that the majority of the OVC were socially isolated and had poor attachment to the people around them. It has been well documented that the OVC suffer from both disturbed social interactions as well as peer relationship problems (Richter et al., 2005; Tarullo et al., 2007; Zhao et al., 2007; Atwine et al., 2005; UNICEF, 2007). The reasons behind these could be the strict orphanages' rules of conduct which limit social interaction, create bad perceptions of people among the children, leading to lack of self-confidence and social skills. The other explanation could be that lack of parental love and care from people in the community and care providers could also ruin their moral values and beliefs affecting their smooth social interaction that leads to a friendly life. This signifies that

healthy child development hinges greatly upon the continuity of good social relationships. Hence, programs focusing on socialization skills should target people in the community and care providers to promote the social development of the OVC.

Lack of extracurricular activities and entertainment were the other psychosocial problems observed in the orphanages. Research reveals that the presence of extracurricular activities and entertainments for OVC can leverage significant improvements in their lives (Nhargava, 2005). These opportunities can provide children with emotional support, develop their physical fitness, and enable them to learn how to interact with other people and develop social network. These opportunities are also key to employability and can foster a child's developmentally important sense of competence. On account of this fact, organizing extracurricular activities and entertainment events in the orphanages is vitally important to enhance children's resilience against psychosocial problems and to develop their wellbeing.

Coping strategies have been described as the cognitive and behavioral efforts one makes to try to endure, escape or minimize the effects of stress (Lazarus, 1966; Lazarus and Folkman, 1984; Dumont and Provost, 1999). In the present study, despite lack of formal and concrete support structures to enhance resilience against psychosocial problems, children in the orphanages reported that they used different strategies to deal with the pain of loss of their parents and the changes in their lives. However, some of the coping strategies, like bury feelings internally and self-discrimination, were not positive and related with lack of assertiveness. Evidence shows that abandoned children, like most people, possess an inherent degree of resilience. Nevertheless, the social support they receive from their peers, associations, organizations, and societies cannot be ignored in this case. Brannon and Feist (2000) speak about the positive link between good health and social support. The theoretical viewpoint of McCubbin et al. (1996) as cited in Broome et al. (2004) also suggests that the coping strategies one uses are based on the resources that are available to the adolescent in their circumstances. Therefore, orphanages should consider the strengthening of psychosocial support programs, such as life skills training, extracurricular activities and entertainment events, mentoring and apprenticeships that encourage the integration of the OVC into the traditional support systems and community understanding of and action on the psychosocial needs of the OVC.

## Conclusion

This study showed that orphan and vulnerable children in the orphanages accessed all the basic services necessary to sustain their lives. Conversely, the study also revealed that the children suffered from a set of

multidimensional and intertwined psychosocial problems that were the least addressed in the orphanages. Thus, interventions to promote the psychosocial wellbeing of the children should focus on areas such as addressing psychological problems, advancing socialization skills, organizing extracurricular activities and entertainments, and improving coping strategies.

## Conflict of interest

The author declared he has no conflict of interest.

## ACKNOWLEDGEMENTS

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*Full Length Research Paper*

# Formula for mid-age of incidence from age-specific prevalence of chronic disease and its application

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This study was aimed to devise a theoretical formula for the mid-age of incidence (MAI) from the prevalence of age groups and to confirm its application. The formula was devised using the concept of lost years of health and then simulated. In the inhabitants' survey, MAI was calculated from the prevalence of liver disease in the areas, and the main cause of disease was analyzed between those areas where MAI was lower than 2.5% of the distribution with significantly high prevalence (HL group) and those areas where MAI was higher than 2.5% of the distribution with significantly high prevalence (HU group). In the computer simulation, MAI was not much different or a little lower than the mid-age of occurrence. In addition, the sum of the incidence rates in the 1-year age groups approximately corresponded to the maximum prevalence within the age groups in the simulation. In the HL group, the main cause of liver disease was alcoholic liver injury; in the HU group, one cause was type C hepatitis, whereas for many others, it was advanced alcoholic liver injury. Thus, the HU and t HL groups were confirmed as active and quiescent areas, respectively. Investigating the cause or stage is considered to be useful in future studies.

**Key words:** Mid-age of incidence (MAI), Lost years of health, chronic disease, prevalence, age specific prevalence.

## INTRODUCTION

Romeder and McWhinnie (1977) introduced the age-adjusted (AA) (Armitage et al., 2002) years of potential life lost (YPLL) rate as follows: when $n_i$ is the population of the $i$th age group in some area, $d_i$ is the number of deaths in some area, $N_{ir}$ is the standard population and $N_r$ is the standard population between the age groups 1 and 70 years, then

This index is referred to as the health index, which denotes the years of potential health lost (YPHL) (Inoue, 2002). The YPHL is calculated by the prevalence between 40 and 74 years old. When di is the number of

$$\text{AA - YPLLrate} = \sum_{i=1}^{69} \left\{ (70 - mid \cdot age \text{ of } i\text{th age group}) \times \left(\frac{d_i}{n_i}\right) \times \left(\frac{N_{ir}}{N_r}\right) \right\} \times 1000$$
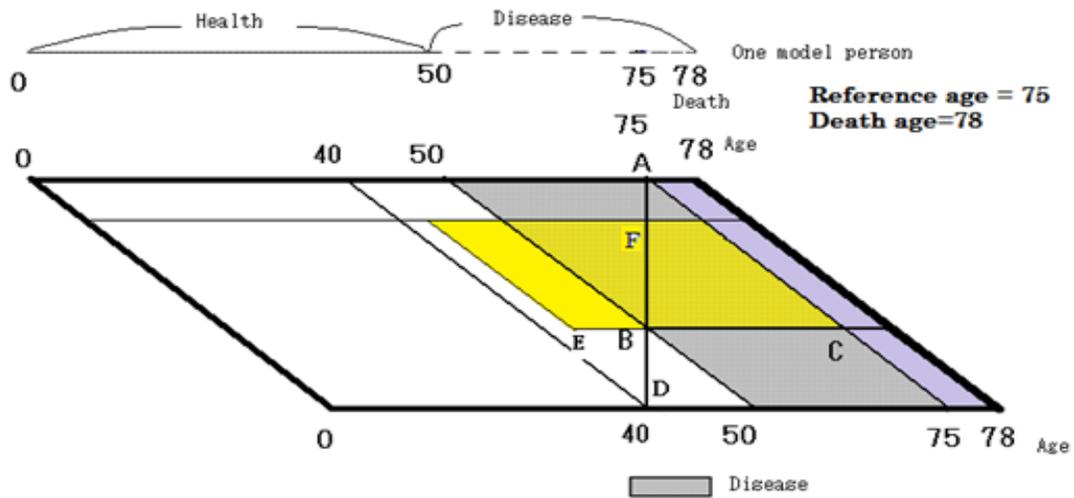
**Figure 1.** Simple model of the theoretical formula for mid-age of incidence (MAI). The straight line AD shows the time when the inhabitants' detection survey was carried out. There are the same model person of 40 years of age at the line AD who shows the bottom of the parallelogram and the same model person of 75 years of age at the time of the line AD who shows the top of the parallelogram. BC=ΔABC×2/AD.

patients in the $i$th age group, $n_i$ is the number of examinees, $P_i = d_i/n_i$ is the prevalence, and the reference age shows T(>74), then the YPHL rate in the $i$th age group is (T-*mid* age of the $i$th age group) × $d_i/n_i$.

$$\text{The AA - YPHL rate} = \sum_{i=40}^{74} \left\{ (\text{T} - mid \cdot age \text{ of the } i\text{th age group}) \times P_i \times \frac{1}{\text{NG}} \right\},$$

where NG is the number of age groups when each age group is in the same period for the equivalent adjustment (Chin, 1961).

The theoretical formula for the mid-age of incidence (MAI) was devised from the conception of the YPHL and was assessed using computer simulation. Furthermore, it was calculated in the inhabitants' detection survey of Japan according to liver disease prevalence, and its application was investigated.

**METHODOLOGY**

**Formula for MAI**

Figure 1 shows the simple model as a guide for the formula. The upper line shows a model of a person who falls ill at 50 years of age

and dies at 78 years. The straight line AD shows the time when the inhabitants' survey was done. A model of a 40-year-old person at time AD is shown at the bottom line of the parallelogram, whereas a model of a 75-year-old person at time AD is shown at the top line. Sequentially, the models are the same along the layer of the horizontal lines in all age groups from 40 (the bottom) to 75 (the top) years of age at the time of the line AD (inhabitants' detection survey) in the parallelogram (Figure 1).

In the area of triangle ABC shows the loss of health years before the age of 75 years, that is, the value of YPHL at time AB. Line BC represents the period of the disease. The length of BC is calculated as the area of triangle ABC × 2 divided by the length of AB. Thus, the period of disease is calculated as follows: (value of YPHL before the age of 75 years at time AD) × 2/number of patients at time AD.

The formula is given as follows:

Where $P_i$ is the prevalence in the $i$th age group, $c_i$ is the normalized weight for length of each age group, and adjustment is used for the equivalent average:

$$the\ MAI\ \text{before}\ 75\ \text{years of age is}\ 75 - \frac{\sum \left\{ c_i \times (75 - mid \cdot age \text{ of the } i\text{th age group}) \times P_i \right\}}{\sum (c_i \times P_i)} \times 2$$

$$= 75 - \frac{Age - adjusted\ YPHLrate\ \text{before}\ 75\ \text{years of age}}{Age - adjusted\ prevalence\ \text{before}\ 75\ \text{years of age}} \times 2.$$

The aforementioned formula shows that the period of disease before 75 years is (*75* - the average age of patients from age-specific prevalence before 75 years) × 2. The Appendix explains this process. The onset age calculated by the formula is referred to

**Table 1.** Categories of medical diagnosis in the inhabitants' detection survey.

| Parameter | Variable | |
| --- | --- | --- |
| Liver disease (confirms suspected disease) | ALT | ≥41 or |
| | AST | ≥36 or |
| | $Y$-GTP | ≥60 |
| Hypertension | Grade 1 | SBP 130-139 or DBP 85-89 (mmHg) |
| | Grade 2 | SBP 140-159 or DBP 90-99 |
| | Grade 3 | SBP 160-179 or DBP 100-109 |
| | Grade 4 | SBP≥ 180 or DBP≥ 110 |
| Hypercholesterolemia | Slight | 200-219mg/dl (especially female over 50 years old; 220-239) |
| | Moderate | 220-239 (240-259) |
| | Severe | ≥ 240 (≥ 260) |
| Diabetes mellitus | Necessary of tutorial | Fasting glucose; less than 126 mg/dl or HbA1c; over than 5.5% and less than 6.1% |
| | Necessary of medicine | Fasting glucose; over than 126 mg/dl or HbA1c; over than 6.1% |
| Anemia (confirms the suspicion) | Hemoglobin; male; less than 13g/dl, female; less than 12g/dl | |
| Kidney dysfunction (confirm suspected disease) | Creatinine in the serum; male; over than 1.2 mg/dl, female over than 1.0 mg/dl | |

SBP; systolic blood pressure; DBP; diastolic blood pressure

as the MAI.

**Computer simulation**

The age range in the simulation is 40 to 79 years with an interval of 1 year.

*Without the death rate*

In the simulation without the death rate, the sum of the occurrence rates within the age groups is set at 0.15, and the shape of occurrences is an isosceles triangle with its vertex at 55.5 years of age and the width of its bottom at 5, 17, or 29 years. The occurrence (incidence) rate of the youngest age group in the simulation is the sum of the incidence rates of the age groups × {2/(width of age groups of incidence +1)}$^2$. The results are the same regardless of the populations.

*With death rate of disease and total death*

The simulation without the death rate reveals that the sum of the occurrence rates of the age groups corresponds to the maximum prevalence in the age groups. In the simulation with the death rate, the sum of the occurrence rates of the age groups is set at 60 per 1000 population. According to the death rate from the disease and the total death rate, the death rate from the disease in the age

group 79 years is set at 0.52/1000; the total death rate is set at 38.9/1000. In the first simulation, the beginning age group for death rates is 42 years, when the occurrence of the disease begins, and the death rate increases in the same proportion until 79 years. In another simulation, the approximate formula used for the death rate of disease is $y = 9.030×10^{-11} x^4 - 1.106×10^{-8} x^3 + 5.245×10^{-7} x^2 - 1.043×10^{-5} x + 7.105×10^{-5}$, which shows an increase with aging, and that for total death is $y = 1.075×10^{-8} x^4 - 1.483×10^{-6} x^3 + 7.452×10^{-5} x^2 - 1.515×10^{-3} x + 1.053×10^{-2}$. These values were obtained from an article reporting the age-specific estimated incidence (ASEI) rate (Inoue, 2013).

The simulation was carried out using the following:

**Number of patients:** Initially, the prevalence or number of patients is 0. The number of patients is calculated as prevalence × total population, and the number of healthy people is given as total population × (1−prevalence). The new number of patients is computed as total number of healthy people × occurrence rates in simulation. The total number of patients becomes number of patients + new number of patients.

**Number of deaths (in the simulation with the death rate):** The number of deaths due to disease is calculated as population × death rate of disease. When the number of patients is more than the number of deaths from the disease, the number of patients is subtracted from the number of deaths.

**Population (in the simulation with the death rate):** When the number of patients is more than the number of deaths from the
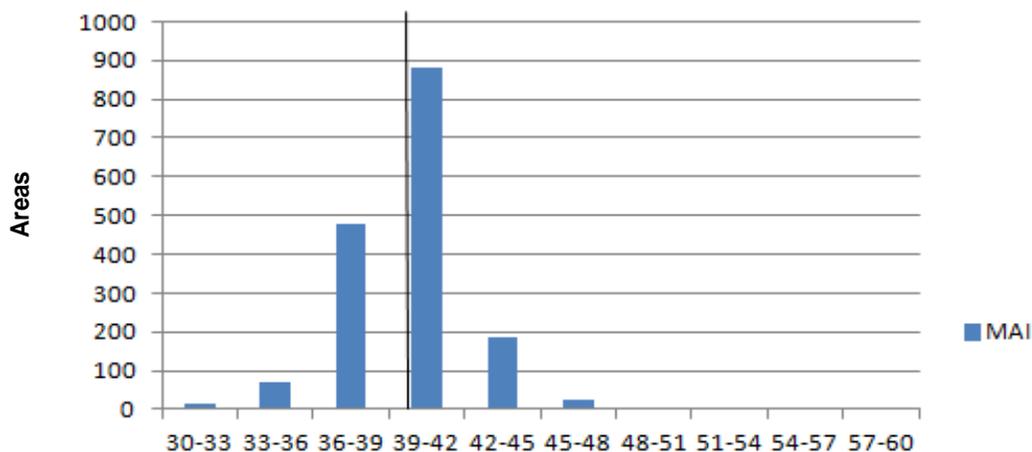
**Figure 2.** Histogram of MAI in moderate hypercholesterolemia. Vertical line shows mean value as 39.2.

**Table 2.** The simulation result without the mechanism of death

| Parameter | Variable | | Value | |
|---|---|---|---|---|
| Simulation setting | Mid-age of occurrence in the simulation | | 55.5 | |
| | Sum of occurrence rates of age groups in the simulation | | 0.150 | |
| | Width of age groups for occurrence | 5 | 17 | 29 |
| | The age groups of occurrence | 53-<u>57</u> | 47-<u>63</u> | 41-<u>69</u> |
| Result — Years when prevalence is constant | Years after beginning of simulation | 27 | 33 | 39 |
| | Youngest age revealing the maximum prevalence | 57 | 63 | 69 |
| | MAI | 54.9 | 54.3 | 53.3 |
| | Difference between MAI and mid-age in the simulation | 0.6 | 1.2 | 2.2 |
| | Maximum prevalence | 0.142 | 0.140 | 0.140 |

Underscoring indicates that the ended incidence was equal to the age when maximum prevalence was revealed.

disease, the number of the population is calculated as population × (1 − death rate of disease).

**Population (in the simulation with the death rate and total death):** When the number of patients is more than the number of deaths from the disease, the number of the population is calculated as population × (1 − total death rate).

**Prevalence:** Prevalence is calculated as the number of patients divided by the entire population.

**Shift in age group:** The population and the prevalence are shifted to the next age group.

These simulations are performed until the age-specific prevalence will be constant, and *MAI* is compared with the mid-age set in the simulation.

**Studies according to the MAI value using practical data**

*MAI* was calculated for the age-specific prevalence on liver function disorder or other disorders obtained from the cities, towns, and villages (hereafter called areas) included in the 2007 inhabitants'

survey of Japan. The prevalence was acquired from the website of the Ministry of Health, Labour, and Welfare. Table 1 shows the categories of liver disease and other diseases (Table 1).

The number of areas from which data could be obtained totaled 1816. The total number of examinees in each area was not uniform, and the number of areas for several scales of examinees was the greatest in the group with 501 to 1000 examinees. Figure 2 shows the distribution of *MAI* in moderate-grade hypercholesterolemia (Figure 2).

The value of *MAI* is calculated using the prevalence until the age of 75 years according to Formula 1.

When $P$ is the prevalence, n is the number of examinees in the area, and $\dot{P}$ is the prevalence in the total area (Japan), the condition $\bar{P} \times n > 5$ is necessary for the binomial distribution to be close to the normal distribution. The AA-P (age – adjusted prevalence) before 75 years was tested using the aforementioned conditions. Thus, *MAI* values were calculated when all the age groups were under this condition (Miller, 1983a).

The *MAI* values were calculated under this condition, and the mean, standard deviation, and skewness of the distribution of *MAI* values were obtained (Miller, 1983b). Thus, the standardization for z=(x-μ)/δ was used for the picking up of the areas, where *MAI* was below or above the 2.5% limit (Miller, 1983c).

In addition, *MAI* was meaningful in cases where the AA-P was
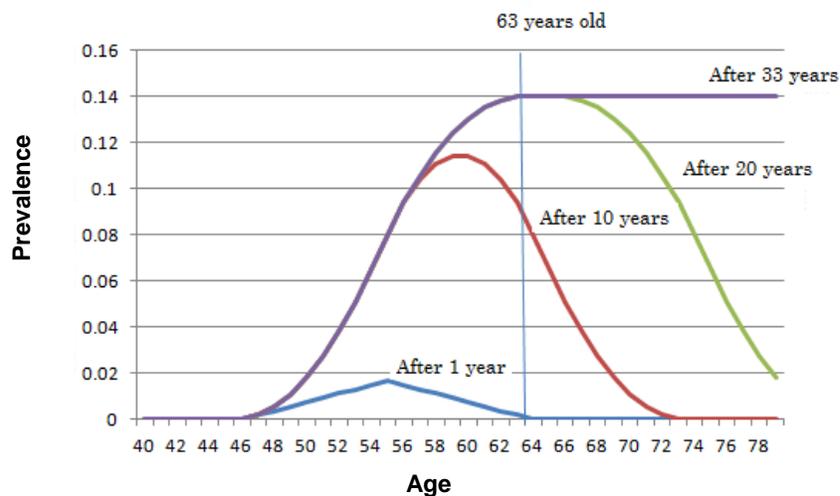
**Figure 3.** Prevalence after several years in the simulation without the death rate and width of occurrence of 17 years. After 1 year in the simulation, the prevalence of the age groups is equal to the incidence rate in the simulation. Vertical line shows the age when the maximum prevalence was revealed.

high. Thus, those areas where the AA-P before 75 years was significantly high compared with the AA-P in the total area, and where *MAI* was lower than the 2.5% limit of the *MAI* distribution, were determined as the HL group (high and lower). Those areas where *MAI* was higher than the 2.5% limit were determined as the HU group (high and upper) (Miller, 1983d,e).

A telephone survey was conducted in several government offices to obtain information on liver disease in the HL and HU groups. The main cause of liver disease found in the HL groups was alcoholic liver injury (hereafter ALI). The analysis of the prevalence of ALI was not age-adjusted because the prevalence in the age groups was small. In a few areas of the HU group, the cause of liver disease was found to be type C hepatitis. Because, the proportion of hepatoma from all deaths was shown, the significance and the main cause of hepatoma in Japan is type C hepatitis (Tanaka et al., 2005).

In many areas of both the HL and the HU groups, the prevalence of ALI was found to be significantly high. Thus, the *MAI* values of liver disease were set as the x-value in areas where the age-adjusted prevalence of liver disease and the crude rate of ALI were significantly high. The y-value was set to 1 if the crude rates of other medical categories between ages 40 and 74 were significantly high against the total rate; otherwise, the y-value was 0. Logistic regression analyses were completed between the *MAI* and the significance in other medical categories (Truett et al., 1967).

## RESULTS

### Computer simulation

Table 2 shows the results of the computer simulations without the death rate, with occurrence widths of 5, 17, and 29 years. The simulation results show that the prevalence within the age groups became constant after several years. The age at which the maximum prevalence was found consistent with the final age for occurrences in the isosceles triangle. Figure 3 shows the simulation without the death rate and a width of

occurrence of 17 years. The slope of change in the prevalence between the beginning and ending age became flatter as the width of the occurrence became broader. *MAI* became younger as the width of occurrence became wider. The sum of the occurrence rates for the 1-year age groups (0.15) is almost the same as the maximum prevalence (Table 2 and Figure 3).

Table 3 presents the simulation with the death rate. The linear model of the death rate is death-1 of disease or total death-1, and the approximate model is death-2. *MAI* is closer to the mid-age setting in the death-2 model than in death-1.

Furthermore, in the case using 3 ×death-1 of the disease, *MAI* was calculated to be younger than in that using death-1.

In the case of death-2 of disease and total death-2, there was no peak in the prevalence within the age groups. The maximum prevalence rate found was higher than the sum of the occurrence rates (0.15), as shown in Figure 4 and Table 3.

### Study using practical data

Table 4 shows the results of the study on liver disease. There were nine HL groups, with the rate within all the areas at 0.54%. The HU groups numbered 12, with a rate of 0.72%. Table 5 shows the prevalence of ALI in the areas; the data on the HL groups are shown in the upper part, whereas the data on the HU groups are in the lower part. In eight of the nine HU-group areas, the rates of ALI were significantly higher (almost p<0.001) than that in Japan; thus, liver function disorders in those areas were judged as ALI.

In one HU-group area, the proportion of death by

**Table 3.** The simulation results with the mechanism of death

| Parameter | | | Value | | | |
|---|---|---|---|---|---|---|
| Simulation setting | Mid-age of occurrence in the simulation | | 60.5 | | | |
| | Sum of occurrence rates of age groups in the simulator | | 0.060 | | | |
| | Width of age groups for occurrence | | 37 | | | |
| | The age groups of occurrence | | 42-78 | | | |
| | **Mechanism of death rate** | **Without death** | **With death-1 of disease** | **With death-1 of disease and total death-1** | **With death-1 × 3 of disease and total death-1** | **With death-2 of disease and total death-2** |
| Result | Year when prevalence are constant | Years after beginning of simulation | 38 | 38 | 38 | 38 | 38 |
| | | MAI | 56.9 | 56.5 | 58.9 | 58.0 | 58.2 |
| | | Difference between MAI and mid-age in the simulation | 3.6 | 4.0 | 1.6 | 2.5 | 2.3 |
| | | Maximum prevalence | 0.058 | 0.050 | 0.088 | 0.059 | 0.078 |

Death-1 of disease and total death-1; simple linear model. Death-2 of disease and total death-2; approximation formula model.
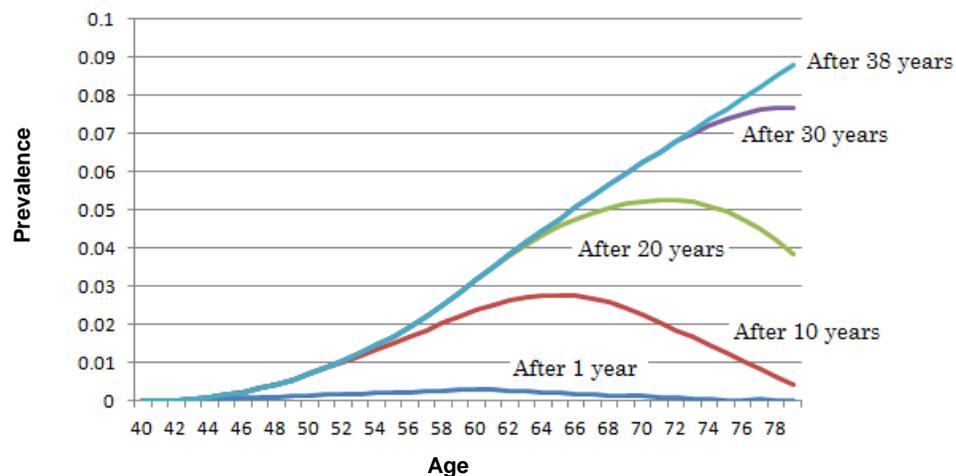


**Figure 4.** Prevalence after several years in the simulation with death rate of disease and total death rate using approximation formula model.

**Table 4.** Proportions of HL group and HU group according to liver disease in the inhabitants' survey.

| Parameter | Variable | |
|---|---|---|
| Number of areas | 1,816 | |
| Number of areas where data were used | 1,664 | |
| | | |
| MAI | Average | 40.1 |
| | Standard deviation | 2.6 |
| | Kurtosis | 10.855 |
| | Skewness | -0.491 |
| | | |
| HL group and HU group | Number of HL group | 9 |
| | Number of HL group/ number of areas | 0.54% |
| | Number of HU group | 12 |
| | Number of HU group/number of areas | 0.72% |

hepatoma was found to be significantly higher than that in Japan; in another area, the proportion was much higher than that in Japan, but not significantly so (p<0.06). It is possible that there were many patients with C-type hepatitis in these areas. The large number of C-type hepatitis infections in the 1920 to 1940s is attributed to the injection treatment for schistosomiasis (Tanaka et al., 2005). Further, in many areas of the HU group, the prevalence of ALI was significantly high.

As can be seen in Table 6, which shows the results of the logistic regression analyses, the *MAI* for liver disease showed a significant positive regression with anemia (P<0.001), hypercholesterolemia (P<0.001), and kidney dysfunction (P<0.01). Alcoholic fatty liver shows hypercholesterolemia, and alcoholic liver cirrhosis shows anemia or kidney dysfunction with the advancement of ALI. Accordingly, ALI in the HU-group was assessed as advanced ALI. (Wade et al., 1996).

Similar analyses were performed in the other medical categories, as shown in Table 6. Another medical category could be either the cause or the result of the disease of *MAI* category in each case if the *MAI* value indicates advancement of the disease. Thus, the sign of the regression coefficient and the existence of significance between the disease and another medical category were not always equal when these diseases were exchanged. The mean age of examinees was calculated as follows: sum of mid-age × number of examinees in the age group/sum of examinees between ages 40 and 74. The regression between the mean age of examinees and the *MAI* of ALI showed significance. The *MAI* value could not be dissociated from the mean age of the examinee, because the *MAI* is calculated by the mean age of the patient, which could be related to the mean age of the examinee.

Japanese food, especially those prepared in the traditional way, is low in calories and high in sodium, unsaturated fatty acid, and dietary fiber (Oiso, 1975; Ueshima et al., 1982; Kuratsune et al., 1985; Kato et al., 1987). Accordingly, it was reasonable that the relationship

between the *MAI* of hypertension and the significance of hypercholesterolemia and diabetes mellitus was shown to have a significant negative regression. The significant negative regression between the *MAI* of hypertension and anemia could be the reason why polycythemia is found in patients with sustained hypertension (Eugene, 1989). Based on the significant negative regression between *MAI* of hypercholesterolemia and liver disease, *MAI* of anemia and hypercholesterolemia or diabetes mellitus, and *MAI* of kidney dysfunction and hypercholesterolemia, malnutrition is found in patients with chronic hepatitis, anemia, or chronic renal failure, whose stored body fat is decreased (John, 2001; Charles, 2001).

## DISCUSSION

### Formula for MAI and simulation

The incidence rate is usually calculated by the number of new cases in the given period/population at risk (Armitage et al., 2002). Then, what is the population at risk or the given period on the *MAI* value? In the simulation, the constant *MAI* was revealed after x years = the reference age–the age in the age group beginning disease (hereafter; youngest age group). Accordingly, the population at risk is the age-class between the youngest age group and the age group until reference age (oldest age group), and the x year is the time to extend back. In the z-axis shows the years to be back, the small wave shows the age-specific incidence rate in each year, and the large curve in 0 year shows the age-specific prevalence. The oldest age group in 0 year corresponds to the youngest age group in x year. For the participating age groups in incidence, the youngest age group is between 0 and x years, and the oldest age group is 0 year only. Accordingly, the year to be extended back for the MAI shows $j(j=0,1,2,3.....,x)$. the reference age shows T. the youngest age group shows a, the incidence rate of $i$ year age group in $j$ year shows $R_{ij}$,

$$\textit{the virtual} \text{ incidence rate of } i \text{ year age group} = \frac{\sum_{j=0}^{T-1-i}(R_{ij})}{T-i}$$

$$\textit{The} \text{ mean age of the } \textit{virtual} \text{ incidence rates} \ \square \ \frac{\sum_{i=a}^{T-1}\left\{(i+0.5)\times\dfrac{\sum_{j=0}^{T-1-i}(R_{ij})}{T-i}\right\}}{\sum_{i=a}^{T-1}\left\{\dfrac{\sum_{j=0}^{T-1-i}(R_{ij})}{T-i}\right\}}$$
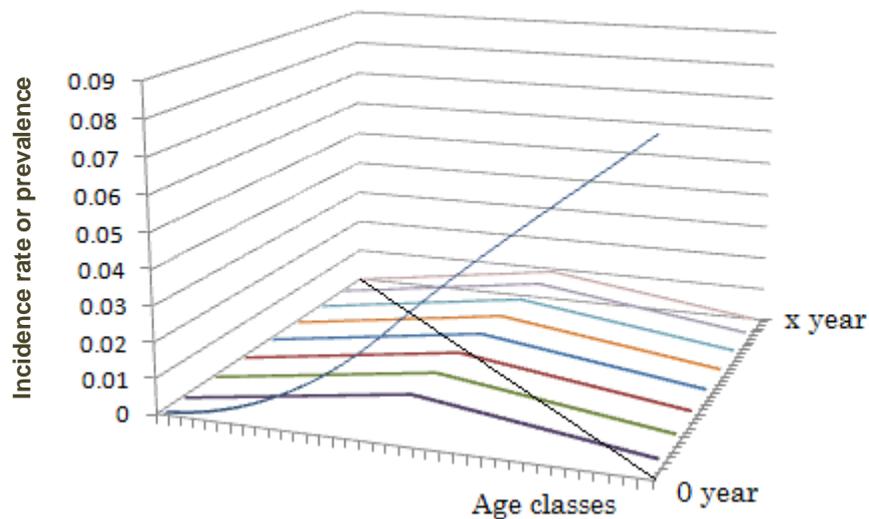


**Figure 5.** The conception of the virtual age-specific incidence rates for MAI. Z-axis is the years to be back for the calculation of MAI. Small curve shows the age-specific incidence rate in each year. Large curve in 0 year shows the age-specific prevalence. Oldest age group in 0 year corresponds to the youngest age group in x year.

The *MAI* is considered to be nearest mean age of the virtual incidence rates (Figure 5). In the 2010 Japan population research, 80.7% of those in the 40 to 49-year age group continued to reside in the city, town, or village in 5 years, and in the older age group, this percentage became almost 90% or more than 90%. Additionally, *MAI* is calculated for life-style disease in the older age group. For those in the age groups older than 40 years old and who were just separated in 5 years, there could be the same property for the area. Variable number of patients or population in the age groups was not an independent random variable, especially to the nearest age groups, and these age groups were considered in one group (Miller, 1983f). Thus, the virtual incidence rate could be considered. In the computer simulation with or without the death rate, the maximum prevalence rate within age groups almost corresponds to the sum of the occurrence rates in the 1-year age groups.

In simulation without the death rate, when the width of occurrence was wide, *MAI* was younger than the setting age. Moreover, in simulation with the death rate, *MAI* was younger than the setting age when the death rate was larger. However, in simulation with death from disease and total death, *MAI* was closer to the setting age than that in the simulation with death from disease only.

The parallelogram in Figure 1 features the line EC, in which a case with no old patients is represented as line AF and a case where these old patients are dead at the time of the inhabitants' detection survey is shown as line AD. In this case, *MAI* should be the age E and younger than B.

**Table 5.** Liver disease and alcoholic liver injury in inhabitants' detection survey in 2007, and death rate of hepation in 2010.

| No. of areas | Region | Group | AA- prevalence before 75 years from LD | AA-75 YPHL rate from LD | MAI from LD | Prevalence between 40 and 74 years from ALI | Death proportion of hepatoma (B/A) | Significance |
|---|---|---|---|---|---|---|---|---|
| Sum | | | 0.151 | 2.51 | 40.5 | 0.054 | 0.027 | |
| 1 | Hokkaidō | | 0.195** | 4.12 | 32.7 | 0.120*** | 0.022 | - |
| 2 | Hokkaidō | | 0.243*** | 5.01 | 33.7 | 0.193*** | 0.000 | - |
| 3 | Hokkaidō | | 0.186* | 3.74 | 34.7 | 0.127*** | 0.000 | - |
| 4 | Kyūshū | | 0.223*** | 4.60 | 33.6 | 0.114*** | 0.048 | - |
| 5 | Kyūshū | HL | 0.201** | 4.09 | 34.3 | 0.060 | 0.000 | - |
| 6 | Kyūshū | | 0.168** | 3.40 | 34.6 | 0.108*** | 0.024 | - |
| 7 | Kyūshū | | 0.199* | 4.09 | 33.8 | 0.131*** | 0.000 | - |
| 8 | Kyūshū | | 0.207** | 4.23 | 34.2 | 0.160*** | 0.059 | - |
| 9 | Kyūshū | | 0.244*** | 4.91 | 34.7 | 0.170*** | 0.000 | - |
| 1 | Hokkaidō | | 0.195*** | 2.86 | 45.6 | 0.058 | 0.007 | - |
| 2 | Kantō | | 0.282*** | 3.90 | 47.3 | CND | 0.000 | - |
| 3 | Chūbū | HU | 0.374*** | 5.59 | 45.2 | 0.116*** | 0.022 | - |
| 4 | Chūbū | | 0.225*** | 3.30 | 45.7 | 0.145*** | 0.018 | - |
| 5 | Kinki | | 0.378*** | 4.97 | 48.7 | 0.056 | 0.007 | - |
| 6 | Kinki | | 0.177*** | 2.62 | 45.3 | 0.103*** | 0.020 | - |
| 7 | Chūgoku | | 0.177*** | 2.62 | 45.4 | 0.170*** | 0.044 | P<0.06 |
| 8 | Shikoku | | 0.305*** | 4.56 | 45.1 | 0.043 | 0.034 | - |
| 9 | Kyūshū | HU | 0.206** | 3.04 | 45.5 | 0.007*** | CND | CND |
| 10 | Kyūshū | | 0.208*** | 3.02 | 46.0 | CND | 0.066 | *** |
| 11 | Kyūshū | | 0.235*** | 3.38 | 46.3 | CND | 0.034 | - |
| 12 | Kyūshū | | 0.188* | 2.71 | 46.2 | 0.021** | 0.027 | - |

AA; Age-adjusted, LD; liver disease, ALI; alcoholic liver injury, CND; cannot be determined, test of significance was performed by two-tail test, *p<0.05, **p<0.01, ***p<0.001.

If *MAI* could become younger as the grade from the death possibility becomes higher, the proportion of the HU group could be small, and thereafter, the upper limit might have to be set as a broad percentage.

The formula for *MAI* is very easy to calculate when there is data on age-specific prevalence.

*MAI* was considered significant when $\bar{P} \times n > 5$ and close to or lower than the actual value.

**Discrimination of main disease or cause in the disorder by MAI**

The quiescent case shown in Figure 6 represents the HU group. The HU group with liver disease was thought to have been infected by type C hepatitis in the past or to have advanced ALI. On the other hand, the cause of liver disease in the HL group was thought to be ALI, which was found to occur in the younger age groups, as shown by the active case (Figure 6).

**Table 6.** The Logistic regression between the MAI of areas where the age-adjusted prevalence of disease was significantly high and the significance belongs to another medical category and regression for mean age of examinees.

| Categories of MAI | | | Liver disease ALI | Liver disease | Hypertension over grade 2 | Hypercholesterolemia over moderate category | Disease mellitus in all categories | Anemia | Kidney dysfunction |
|---|---|---|---|---|---|---|---|---|---|
| MAI | | Minimum value | 32.7 | 32.7 | 38.1 | 35.6 | 37.7 | 18.7 | 31.7 |
| | | Maximum value | 45.7 | 48.7 | 52.7 | 47.2 | 52.8 | 50.5 | 58.6 |
| Number of data | | | 32.7 | 587 | 518 | 384 | 594 | 508 | 438 |
| Mean age of examine between 40 and 74 years | | Minimum value | 55.8 | 55.8 | 56.1 | 56.9 | 55.8 | 56.1 | 56.9 |
| | | Maximum value | 66.2 | 66.7 | 67.1 | 65.7 | 66.4 | 66.7 | 66.7 |
| | | significance | ** | *** | - | - | - | - | - |
| Other disease | Hypertension Over 2 grade | Mean | 0.35 | 0.37 | | 0.45 | 0.32 | 0.32 | 0.37 |
| | | Coefficient | 0.07 | 0.03 | CND | -0.15 | -0.14 | -0.08 | 0.01 |
| | | Significance | - | - | | ** | *** | ** | - |
| | Hypertension 3 grade | | | | | | | | |
| | Hypercholesterolemia over moderate category | Mean | 0.26 | 0.25 | 0.32 | | 0.25 | 0.32 | 0.30 |
| | | Coefficient | 0.20 | 0.11 | -0.20 | CND | -0.06 | -0.07 | -0.11 |
| | | Significance | *** | * | *** | | - | ** | ** |
| | Diabetes mellitus | Mean | 0.46 | 0.42 | 0.41 | 0.49 | | 0.50 | 0.39 |
| | | Coefficient | -0.18 | -0.08 | -0.32 | -0.05 | CND | -0.09 | -0.01 |
| | | Significance | - | * | *** | - | | *** | - |
| | Anemia | Mean | 0.40 | 0.37 | 0.36 | 0.47 | 0.40 | | 0.33 |
| | | Coefficient | 0.19 | 0.09 | -0.27 | 0.02 | -0.06 | CND | 0.00 |
| | | Significance | *** | * | *** | - | - | | - |
| | Liver disease | Mean | | | 0.43 | 0.39 | 0.40 | 0.43 | 0.44 |
| | | Coefficient | CND | CND | -0.06 | -0.12 | -0.04 | 0.01 | -0.04 |
| | | Significance | | | - | * | - | - | - |
| | Kidney dysfunction | Mean | 0.25 | 0.36 | 0.33 | 0.35 | 0.28 | 0.29 | |
| | | Coefficient | 0.15 | 0.17 | 0.01 | 0.21 | -0.05 | -0.5 | CND |
| | | Significance | ** | *** | - | *** | - | $P < 0.06$ | |

CND: Cannot be determined; ie., the calculated MAI values of the disease and of another category were same. Mean of another category was shown sum of 1/number of date. *; $p < 0.05$, **; $p < 0.01$, *** , $p < 0.001$.
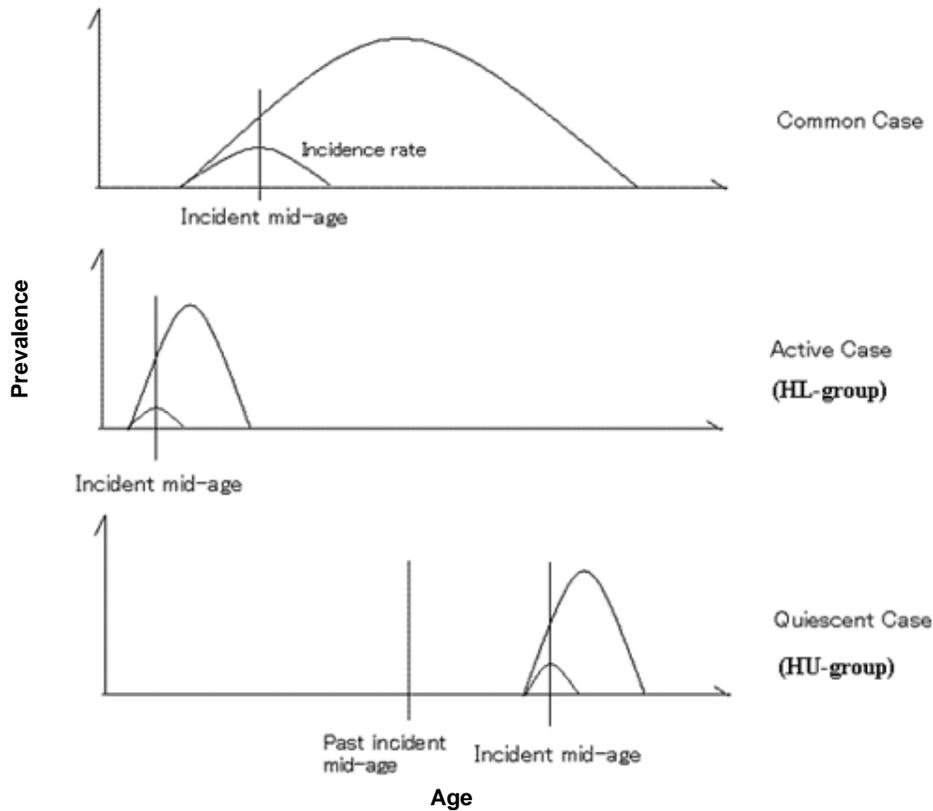
**Figure 6.** Models of common, quiescent and active cases in disease.

Further, in several medical categories, significance related to the medication was found. In the non-HU and non-HL groups, there could be patients in the early and advanced stages of disease in those areas where the prevalence could be shown to be very high.

This method is called "MAI analysis." An investigation of the causes in the HL or HU group might be considered useful in future studies, allowing, for example, patients in the advanced or early stage of disease to be found easily. These procedures could help the advancement of the public health in the communities. Furthermore, the mechanism for the advance of the chronic disease could be revealed by this analysis, and this procedure might help or confirm the outcome from the basic medicine.

**Reference age for calculation of MAI**

In the 2005 life table of Japan, the survival rate at 75 years was 69.1% for men and 85.0% for women (Japanese Government, 2009). Thus, the reference age

of 75 years could be used in this study because of these high rates of survival.

**Application of MAI analysis in death**

The mean age of death and death rate could be used instead of the prevalence. Thus, the different causes under the same category of death could be revealed in this analysis.

**Conclusion**

The theoretical formula for the MAI of chronic disease, calculated using the prevalence before the age of 75 years in cursory age group, is given as following. Where $P_i$ is the prevalence in the $i$th age group, $c_i$ is *the* normalized weight for *length* of each age group, and age adjustment is used for the equivalent average;

$$\textit{the MAI}\ \text{before}\ 75\ \text{years of age is}\ 75 - \frac{\sum\{c_i \times (75 - mid \cdot age\ \text{of the}\ i\text{th age group}) \times P_i\}}{\sum(c_i \times P_i)} \times 2$$

$$= 75 - \frac{Age - adjusted\ YPHLrate\ \text{before}\ 75\ \text{years of age}}{Age - adjusted\ prevalence\ \text{before}\ 75\ \text{years of age}} \times 2.$$

The sum of the incidence rates within the 1-year age groups almost corresponds to the maximum prevalence of chronic diseases within age groups. *MAI* could be calculated at an age younger than the actual age according to the severity of the disease correlated to death. When data on the age-specific prevalence of a chronic disease in all areas were present, those areas where the age-adjusted prevalence was significantly high and where *MAI* was distinguished by a limit lower than 2.5% of the distribution of *MAI* were classified as the HL group. These areas were considered active areas for the incidence of the disease. Those areas where the age-adjusted prevalence was significantly high and where *MAI* was distinguished by a limit higher than 2.5% of the distribution of *MAI* were classified as the HU group. These areas were considered quiescent areas for the incidence of the disease.

Some parts of this study were already demonstrated at the Joint Scientific Meeting of the International Epidemiological Association Western Pacific Region and the Japan Epidemiological Association in 2010 (Saitama).

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## Conflict of Interests

The author(s) have not declared any conflict of interests.

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**Appendix**

**Process of acquiring the formula for MAI**

There are deflections within the age groups if there are multiple persons in each age group. Therefore, normalized weights were acquired by the reciprocal of the number of examinees, as shown by the following formula:

When $n_i$ is the number of examinees in the $i$th age group (i = 40,41,42,…74),

the reciprocal of the number of examinees becomes $1/n_i$ for the weights, while

*the* normalized weights become $\dfrac{1/n_i}{\sum(1/n_i)}$.

The numerator is the YPHL before the age of *75 years*, which is indicated as the area of

triangle ABC, i.e., $\sum[\{75-(i+0.5)\}n_i P_i]$, and the dominator is the number of patients,

represented by line AB, i.e., $\sum(n_i P_i)$.

*The* period of disease before the age of *75 is*
$$\dfrac{\sum\left[\{75-(i+0.5)\}\times n_i \times P_i \times \dfrac{(1/n_i)}{\sum(1/n_i)}\right]}{\sum\left\{n_i \times P_i \times \dfrac{(1/n_i)}{\sum(1/n_i)}\right\}}\times 2$$

$$=\dfrac{\dfrac{1}{\sum(1/n_i)}\sum[\{75-(i+0.5)\}\times P_i]}{\dfrac{1}{\sum(1/n_i)}\sum(P_i)}\times 2 = \dfrac{\sum[\{75-(i+0.5)\}\times P_i]}{\sum(P_i)}\times 2$$

Therefore, *the* mid - age of incidence (MAI), shown as point B in Figure 2, is

$$75-\dfrac{\sum[\{75-(i+0.5)\}\times P_i]}{\sum(P_i)}\times 2.$$

In the above formula, the width of the $i$th age group is 1 year.

In the inhabitants' survey in Japan, the age groups are 40 - 49, 50 - 59, 60 - 64, 65 - 69,

and 70 - 74 years, covering the ages 40 to 74 years.

Therefore, *MAI* is $75-\dfrac{\sum\{c_i \times (75-mid\cdot age \text{ of } i\text{th age group})\times P_i\}}{\sum(c_i \times P_i)}\times 2$

$=75-\dfrac{\text{Age - adjusted YPHL before 75 years of age}}{\text{Age - adjusted prevalence before 75 years of age}}\times 2,$

where $c_i$ refers to 2/7, 2/7, 1/7, 1/7 and 1/7. $\cdots$ Formula – 1.

**Meaning of MAI**

Formula 1 can be rewritten as follows:

The period of disease before 75 years of age is $\dfrac{\sum\left[\{75-(i+0.5)\}P_i\right]}{\sum(P_i)}\times 2$

$=\left[\dfrac{75\sum(P_i)}{\sum(P_i)}-\dfrac{\sum\{(i+0.5)\times P_i\}}{\sum(P_i)}\right]\times 2=\left[75-\dfrac{\sum\{(i+0.5)\times P_i\}}{\sum(P_i)}\right]\times 2.$

On the other hand, when the number of examinees in all the age groups is a constant value N, and the number of patients in the $i$th age group is $d_i$,

the average age of the patients is $\dfrac{\sum\{(i+0.5)\times d_i\}}{\sum(d_i)}=\dfrac{\sum\{(i+0.5)\times P_i N\}}{\sum(P_i N)}$

$=\dfrac{\sum\{(i+0.5)\times P_i\}}{\sum(P_i)}.$

The formula above shows that the period of disease before *75* years is: (*75* — *the* average age of patients from age-specific prevalence) × 2.

*Full Length Research Paper*

# Status of modern contraceptive use among married women in Debre Birhan District, Ethiopia

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Unless evidence based decisions are made based on local contexts, the low prevalence level of contraceptive use and the corresponding higher total fertility rate will make Ethiopia to remain the most populous country in Africa. The purpose of this study was to assess the status of modern contraceptive use among married women in Debre Birhan district, Ethiopia. A community based cross-sectional study was conducted among married women of reproductive age. Systematic random sampling technique was used to choose 851 study subjects. Before data collection, ethical clearance was obtained from the institution, and data was collected by trained diploma nurses using pretested structured questionnaire and analyzed by statistical package for social sciences (SPSS), version 20. Logistic regression analysis was employed to identify the predictors of modern contraceptive use. Modern contraceptive prevalence rate among married women was 46.9%. Injectables were the most frequently used type of modern contraceptive method (62.9%), followed by intrauterine device (16.8%), pills (14%), norplant (4.3%), male condom (1.2%) and female sterilization (0.8%). Multiple logistic regression model revealed that the need to have more children [AOR 95% CI: 9.27 (5.43 to 15.84)], husband approval [AOR 95% CI: 2.82 (1.67 to 4.80)] and husband-wife communication about contraceptives [AOR 7.32, 95% CI (3.60 to 14.86)] were found to be an independent predictors for the use of modern contraceptives. There were no statistical significant differences between modern contraceptive use and other socio-demographic and reproductive health related variables after an adjustment. Modern contraceptive use declined among married women in the district. The culture of publicly discussing the use of contraceptives and breaking the silence among the people demands substantial efforts. Considering users of contraceptives as deviant also requires paradigm shift in thinking.

**Key words:** Debre-Birhan, married women, modern contraceptive, use.

## INTRODUCTION

Despite the introduction of modern contraceptives in Ethiopia in 1966 (Korra, 1997; Assefa et al., 2006)

contraceptive prevalence rate (29%) remained lowest (Central Statistical Authority, 2011). The country is the second most populous in Africa with a total fertility rate of 4.85 (Population Reference Bureau, 2009). The importance and benefits of slowing down population growth does not seem to get more attention by the government. Maternal and child health related problems are also rampant in the country. Unwanted pregnancy is among the prominent reproductive health related problems (USAID Health Policy Development, 2010) resulting in unsafe abortion to be the most significant cause for maternal morbidity and mortality (World Health Organization (WHO), 2004). Imagine how appropriate use of modern contraceptives would save the life of millions of women, but with this current rate of utilization, the country may not be successful in achieving one of the indicators of Millennium Development Goal 4 and 5 unless all stakeholders are able to exert substantial and multidimensional efforts collaboratively.

However, local government efforts complemented by strong support of NGOs working on reproductive health have not been able to bring the desired impact as demanded and expected. Much remains to be done in pinpointing the main local context contributing factors for the low utilization of modern contraceptives. Program implementers/stakeholders need to make evidence-based decisions based on reliable information for action if service provision needs to be improved. Reproductive health strategies need to be tailored taking the potential risk factors of the local situation into consi-deration, otherwise, the trend may continue as such and further damages may occur. Thus, the need to improve modern contraception use within the country in one way or the other is a must to do assignment for all potential stakeholders.

Currently, family planning service is offered as free of charge in both governmental and NGO health facilities in Ethiopia, including hospitals, clinics, health centers and health stations. But, Ethiopia is among countries with low contraceptive prevalence rate, with only 28% at national level among married women, respectively, (Central Statistical Authority, 2011). Factors that influence contraceptive use are multifaceted and challenging. Different studies evidenced that socio-demographic, socio-cultural and socio-economic factors (Beekle and Mccabe, 2006; Ibnouf et al., 2007; USAID Ethiopia, 2010) mostly affected women's knowledge and use of contraception. More specifically, a woman's age (Kebede, 2006; Ibnouf et al., 2007; Chourn, 2008), num-ber of living children (Ali et al., 2004), parity (Stephenson and Hennink, 2010), desire to have children (Ibnouf et al., 2007; Chourn, 2008; Stephenson and Hennink, 2010) educational level (Beekle and Mccabe, 2006; Ibnouf et al., 2007; Chourn, 2008; Nega, 2008; Saleem and Pasha, 2009; Stephenson and Hennink, 2010), occupation (Ali et al., 2004; Kebede, 2006; Chourn, 2008; Stephenson and Hennink, 2010), and

income (Ali et al., 2004; Haile and Enqueselassie, 2006; Ibnouf et al., 2007; Chourn, 2008) majorly impact woman's use of modern contraceptive methods. Yet, these determinant factors and others to the use mo-dern contraceptives have not been studied in Debre Berhan district. Existing information in the district on this regard is very often limited and scarce (Beekle and Mccabe, 2006; Nega, 2008; Saleem and Pasha, 2009). Hence, the study aims to investigate potential risk factors that affect utilization of modern contraceptives so that program implementers would know where to act more to bring about the desired changes within a given period of time.

## METHODOLOGY

### Study design and area

A Community-based cross-sectional study was carried out among married women aged 15 to 49 year in Debre Birhan district, Ethiopia. The district had nine Kebeles (the smallest administrative divisions) with an estimated total population of 72,097 (Federal Democratic Republic of Ethiopia population and Census Commission, 2007) of whom 23% were estimated to be married. Based on information obtained from the District Health Office, family planning services were available in most of the health institutions (one hospital, one health center, and 18 clinics) including four health posts.

### Sample size and sampling

EPI INFO was used to calculate the sample size using single population proportion formula based on an assumption that 29% of the modern contraceptive prevalence utilization in Ethiopia, and design effect of 2 (The main reason of using design effect of 2 is to reduce the variability as a result of two stages that we passed from the District level to village and then household level). A total of 851 study subjects were selected from all married women who lived at least for six month in the district using systematic random sam-pling technique. Simple random sampling technique was applied for the selection of representative Kebeles. In cases of selected households with more than one eligible study subjects, only one was chosen using a lottery method. If an eligible study subject was not found from a selected household, the next household with an eligible study subject in the clockwise direction was included in the sample.

### Data collection

Pretested structured questionnaire which composed of closed-ended questions was used to collect the data on variables related to socio-demographic characteristics, reproductive history, modern contraceptive use and other related factors. Female diploma-holding nurses were recruited as data collectors and collected the data through face-to-face interview after being trained for two days on interview techniques, data collection methods and confidentiality and privacy issues. Oral consent was obtained from each participant once the purpose, confidentiality and anonymity of data for this study was explained to each individual. Study subjects who were not available in the household during the first visit were revisited two more times before the women in the next household made the substitution. Two immediate supervisors were assigned

to help the data collectors during the process of data collection. The questionnaire was developed and administered in Amharic, the local language.

## Data analysis

Data were entered and cleaned using EPI INFO software and then analyzed using SPSS 18. Univariate analysis was used to describe study variables accordingly whereas Bivariate regressions analysis with crude odds ratio (COR) along with the 95% confidence interval was used to verify the association between covariates and modern contraceptive use. Multivariate Logistic regression analysis on the other hand was carried out to determine the adjusted effect of each factor on modern contraceptive use. Variables with more than two categories were entered into the model in the form of two "indicator" contrasts comparing each category to the first group as reference. Variables that were statistically significant at the bivariate level were entered into a multivariate logistic regression analysis, and the strength was presented using odds ratios and 95% confidence intervals at the conventional P-value =0.05 level. The significance for variable removal and entry was set to 0.10 and 0.05 respectively. The Hosmer and Lemeshow test was used to check the goodness-of-fit of the model as well.

## Ethical clearance

Ethical clearance was secured from the Institutional Ethical Committee of Amref Health Africa and Debre Berhan University. Official letter of cooperation was taken from Amref Health Africa and Zonal Health Department where the study was undertaken. Consent was obtained from each respondent. Anonymity and confidentiality were ensured for information obtained from the charts reviewing.

## RESULTS

### Socio-demographic characteristics

Of all 851 married women who responded to the questionnaire, the majority of the respondents were Amhara by ethnicity and Orthodox by religion. The mean age of the respondents was 29.5 ± 6.6 years. The proportion of illiterate respondents was as high as 22.3%, and more than three-fourth of the respondents were from urban areas Table 1.

### Reproductive history

The number of married women who ever experienced birth was eight times higher than their counterparts. The average number of living children per woman was 2.37. In addition, 498 (58.5%) of respondents had a desire to have one or more children in the future, and the average number of desired children was 3.54. Among the pregnant women, 21.6% reported as unwanted and resulted 5.3% abortion rate Table 2.

### Married women's awareness about modern contraceptives

Of all respondents, 98.5% heard about either of the contraceptive methods. Their main sources of information were health professionals of the health centers (66.83%), radio programs (57.4%), television program (55.08%) and health extension workers (20.17%). The most commonly reported types of modern contraceptives were injectable (98.9%) and pills (97.3%). In addition, child spacing (70.5%), prevention of unwanted pregnancy (63%), limiting the number of children (48.6%) and prevention of human immune-deficiency virus/acquired immune deficiency syndrome (HIV/AIDS) (12.3%) were mentioned as an advantage of modern contraceptive methods among study participants and 735 (86.4%) of respondents still had a desire to know more about contraceptives while the remaining 116 (13.6%) of respondents did not have any desire to know more about it Figure 1.

### Communication about modern contraceptives

Only one-fifth of married women discussed contraceptive related issues with the nearby health extension workers whereas the proportion of married women who discussed with their husbands was more than $3/4^{th}$ of the total respondents. However, $1/4^{th}$ of the respondents did not get approval to u s e contraceptives of their choice by their husbands Table 3.

### Modern contraceptive use

More than half of the respondents, 448 (52.6%) had ever used contraception. Three hundred a n d ninety nine (46.9%) of them had been using it during the time of the interview. Injectable 251 (62.9%) were among the most frequently used type of contraceptives followed by IUD 67 (16.8%), pills 56 (14%), norplant, 17 (4.3%) and male condom 5 (1.2%), and the remaining 3 (0.8%) used permanent type of modern contraceptive method namely female sterilization. Of the total current modern contraceptive users, 335 (80.3%) were from the urban areas and the remaining 82 (19.7%) were from rural areas. Of currently married women who had ever used contraceptives, 49 (10.9%) of them discontinued taking contraceptives. The total number of married women who never used contraceptives was 403 (47.4%), and reasons for discontinuing and/or never using modern contraceptives were, need of more children (160), natural method (82), religion probation (56), husband disapproval (56) and health concern were the frequently mentioned.

### Relationship between socio-demographic characteristic of married women and use of modern contraceptives

Results of Bivarate analysis showed that education status of the women, average family income, educational
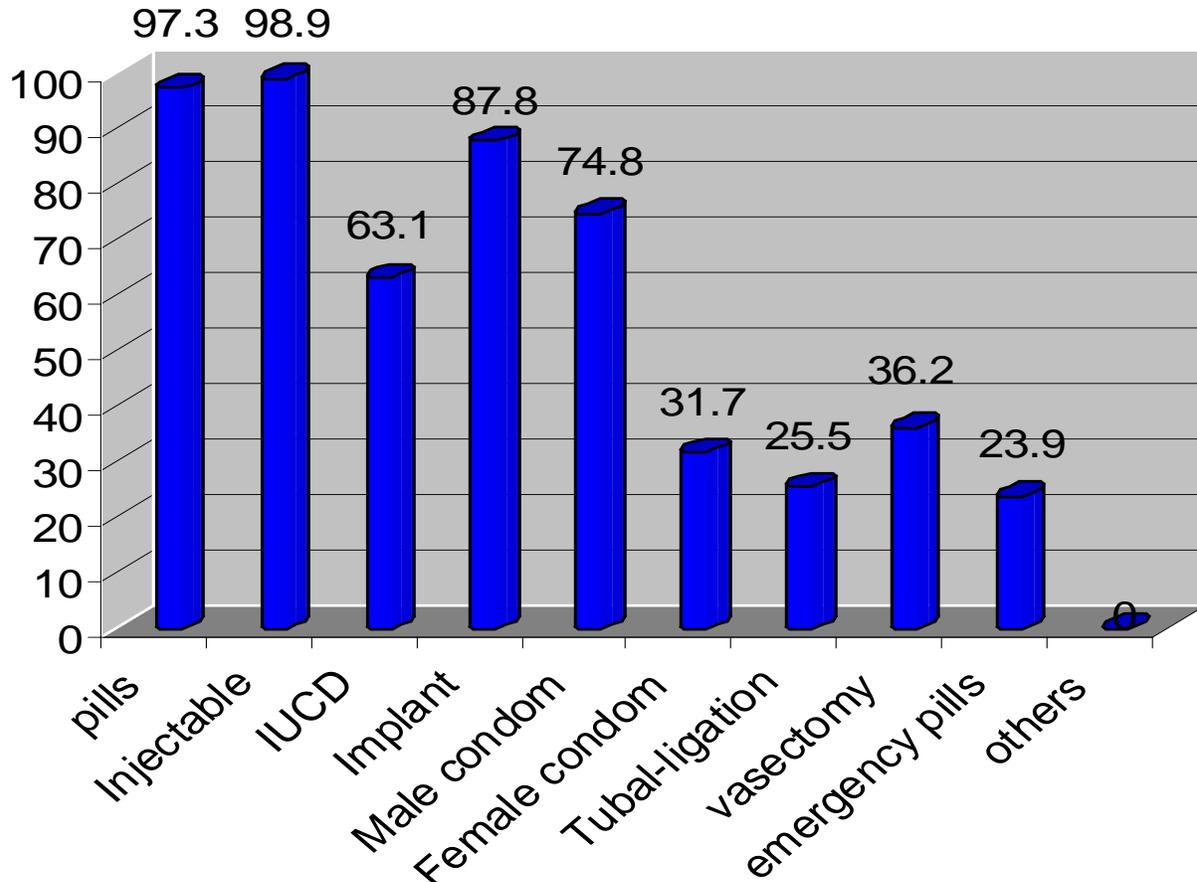
**Figure 1.** Married women's awareness about modern contraceptives in Debre Birhan, Ethiopia.

status of the husband and having access to television and radio were statistically significant to the use of modern contraceptives unlike the place of residence, age and educational status of the husband (P-value <0.05) Table 4.

**Relationship between children, communication and Knowledge related variables and use of modern contraceptives**

As shown in Table 5, all tested variables showed statistically significant associations with the use of modern contraceptives at a P-value < 0.01. For example, women who did not wish to have more children in the future were 6.42 times more likely to use modern contraceptive than women who wished to have children within two years (OR 6.42, 95% CI 4.21 to 9.78). Women who had three or four children were 2.45 times more likely to use modern contraceptive than women who had no children (OR 2.45, 95% CI 1.5 t o 3.99). Likewise, those women who discussed about contraceptives more than three times with their husbands were 14.89 times more likely to use modern

contraceptive than women who did not discuss family planning with their husband (OR 14.89, 95% CI 9.08 to 24.43).

**Determinant factors**

As presented in Table 6, results of the multiple logistic regression model revealed that women's desire for more children, husband-wife discussion and approval of husband to use modern contraceptive were among the predictors of modern contraceptive use by married women. Married women who did not desire more children at all were 7.75 times more likely to use modern contraceptive methods than those women who desire children within two year. Similarly, women who had discussion with their husband on contraceptives were more likely to use modern contraceptives than their counterparts. But variables like educational status of the women and husband, residence, women and husband occupation and discussion with health extension workers including average monthly family income were not statistically significant to the use of modern contraceptives in the multiple logistic model.

**Table 1.** Socio-demographic characteristics of married women in Debre Birhan District, Ethiopia.

| Variable | Frequency (N=851) | Percentage (%) |
|---|---|---|
| **Residence** | | |
| Urban | 652 | 76.6 |
| Rura | 199 | 23.4 |
| | | |
| **Age** | | |
| 15-19 | 21 | 2.5 |
| 20-24 | 174 | 20.4 |
| 25-29 | 273 | 32.1 |
| 30-34 | 159 | 18.7 |
| 35-39 | 145 | 17.0 |
| 40-44 | 62 | 7.3 |
| 45-49 | 17 | 2.0 |
| | | |
| **Ethnicity** | | |
| Amhara | 787 | 92.5 |
| Oromo | 38 | 4.2 |
| Tigrae | 17 | 2.0 |
| Others | 11 | 1.3 |
| | | |
| **Religion** | | |
| Orthodox | 796 | 93.5 |
| Muslim | 27 | 3.2 |
| Protestant | 22 | 2.6 |
| Others | 6 | 0.7 |
| | | |
| **Educational level** | | |
| Can't read & write | 190 | 22.3 |
| Read and write | 77 | 9.0 |
| Primary school | 280 | 32.9 |
| Secondary school | 225 | 26.4 |
| $12^+$ | 79 | 9.3 |
| | | |
| **Occupational status** | | |
| House wife/house work | 495 | 58.2 |
| Merchant | 89 | 10.5 |
| Farmer | 53 | 6.2 |
| Daily laborer | 113 | 13.3 |
| Government employee | 71 | 8.3 |
| Others | 30 | 3.5 |
| | | |
| **Average monthly income of the family** | | |
| $\leq 300$ | 213 | 25 |
| 301- 600 | 289 | 34 |
| 601- 927 | 137 | 16.1 |
| $\geq 928$ | 212 | 24.9 |
| | | |
| **Having radio/TV** | | |
| Radio only | 293 | 34.4 |
| TV only | 80 | 9.4 |
| Both radio and TV | 324 | 38.1 |
| None of them | 154 | 18.1 |

**Table 2.** Reproductive history of married women in Debre Berhan District, Ethiopia

| Variable | Frequency | Percentage |
|---|---|---|
| **Previous delivery status** | | |
| Yes | 758 | 89.1 |
| No | 93 | 10.9 |
| | | |
| **Desire for more children** | | |
| Within two years | 201 | 23.6 |
| After two years | 297 | 34.9 |
| No more wanted | 353 | 41.5 |
| | | |
| **Desired number of children** | | |
| 1-2 | 141 | 28.3 |
| 3-4 | 270 | 54.2 |
| ≥5 | 87 | 17.5 |
| | | |
| **Have living child** | | |
| Yes | 754 | 88.6 |
| No | 97 | 11.4 |
| | | |
| **Number of living children** | | |
| 1-2 | 424 | 56.2 |
| 3-4 | 287 | 38.1 |
| ≥5 | 43 | 5.7 |
| | | |
| **Number of living children** | | |
| Male only | 179 | 23.7 |
| Female only | 185 | 24.5 |
| Both male and female | 390 | 51.7 |
| | | |
| **Current pregnancy status** | | |
| Pregnant | 51 | 6.0 |
| Not pregnant | 800 | 94.0 |
| | | |
| **Status of their current pregnancy** | | |
| Wanted | 40 | 78.4 |
| Wanted later | 9 | 17.7 |
| Not wanted | 2 | 3.9 |
| | | |
| **Previous abortion status** | | |
| Yes | 45 | 5.3 |
| No | 806 | 94.7 |
| | | |
| **Way of abortion** | | |
| Health professionals | 25 | 55.6 |
| Traditional medicine | 13 | 28.9 |
| Others | 7 | 15.5 |

**Table 3.** Communication about modern contraceptives in Debre Birhan, Ethiopia.

| Variable | Frequency | Percentage |
|---|---|---|
| **Discussion with health extension workers about Family planning** | | |
| Yes | 169 | 19.9 |
| No | 682 | 80.1 |
| **Number of discussions with health extension workers** | | |
| Once | 25 | 14.8 |
| Twice | 20 | 11.8 |
| More than twice | 124 | 73.4 |
| **Spousal approval of communication with reproductive health** | | |
| Approved | 160 | 94.8 |
| Not approved | 5 | 2.9 |
| Do not know | 4 | 2.3 |
| **Spousal communication about contraceptives** | | |
| Yes | 648 | 76.1 |
| No | 203 | 23.9 |
| **Number of discussion with Spouse about contraceptives** | | |
| Twice | 56 | 8.6 |
| Three times | 89 | 13.7 |
| More than three times | 340 | 52.5 |
| **Spousal approval of use of modern contraceptives** | | |
| Approved | 585 | 68.7 |
| Not approved | 211 | 24.8 |
| Do not know | 55 | 6.5 |
| **Husband knows wife's modern contraceptive use or not** | | |
| Yes | 720 | 84.6 |
| No | 131 | 15.4 |

**Table 4.** Relationship between socio-demographic characteristic of married women and use of modern contraceptives in Debre Birhan District, Ethiopia.

| Explanatory variable | Modern contraceptive | | Crude | 95% CI | | p-value |
|---|---|---|---|---|---|---|
| | Yes | No | | Lower | Upper | |
| **Residence** | | | | | | |
| Urban | 335 | 317 | 1.35 | 0.98 | 1.86 | 0.067 |
| Rural | 82 | 117 | 1 | - | - | |
| **Age** | | | | | | |
| 15-24 | 85 | 110 | 1 | - | - | |
| 25-34 | 206 | 226 | 1.18 | 0.84 | 1.66 | 0.047 |
| 35-49 | 108 | 116 | 1.21 | 0.82 | 1.77 | |
| **Educational status of the mother** | | | | | | |
| Can't read and write | 72 | 118 | 1 | - | - | |
| Primary education | 173 | 184 | 1.54 | 1.08 | 2.21 | 0.017 |
| Secondary and above | 154 | 150 | 1.68 | 1.16 | 2.44 | |
| **Educational status of the father** | | | | | | |
| Can't read and write | 35 | 61 | 1 | - | - | |
| Primary education | 176 | 202 | 1.52 | 1.96 | 2.41 | 0.044 |
| Secondary and above | 188 | 189 | 1.73 | 1.09 | 2.75 | |

**Table 4.** Contd.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Husband occupation** | | | | | | |
| Farmer | 74 | 111 | 1 | - | - | |
| Private employ | 197 | 223 | 1.33 | 0.93 | 1.88 | 0.067 |
| Government employ | 128 | 118 | 1.63 | 0.12 | 2.39 | |
| | | | | | | |
| **Family monthly income** | | | | | | |
| ≤300 | 97 | 116 | 0.39 | 1.4 | 1.87 | |
| 301-600 | 115 | 174 | 0.47 | 1.33 | 1.67 | 0.001 |
| 601-927 | 63 | 74 | 0.6 | 1.39 | 1.93 | |
| ≥928 | 124 | 88 | 1 | - | - | |
| | | | | | | |
| **Television and radio access** | | | | | | |
| Only radio | 126 | 167 | 1.09 | 1.73 | 1.92 | |
| Only television | 36 | 44 | 1.18 | 1.69 | 2.04 | 0.018 |
| Both television and radio | 174 | 150 | 1.68 | 1.14 | 2.47 | |
| No | 63 | 91 | 1 | - | - | |

**Table 5.** Relationship between children, communication and Knowledge related variables  and use of modern contraceptives in Debre  Birhan District, Ethiopia.

| Explanatory variable | Contraceptive | | Crude OR | 95% CI | | p-value |
|---|---|---|---|---|---|---|
| | Yes | No | | Lower | Upper | |
| **Desire for more children** | | | | | | |
| Want within two years | 35 | 166 | 1 | - | - | |
| Want after two years | 161 | 136 | 5.62 | 3.65 | 8.63 | 0.001 |
| No more desire at all | 203 | 150 | 6.42 | 4.21 | 9.78 | |
| | | | | | | |
| **Number of living children** | | | | | | |
| None | 30 | 67 | 1 | - | - | |
| 1-2 | 206 | 218 | 2.11 | 1.32 | 3.38 | <0.001 |
| 3-5 | 150 | 137 | 2.45 | 1.5 | 3.99 | |
| >5 | 13 | 30 | 2.95 | 1.44 | 2.11 | |
| | | | | | | |
| **Discussion with the husband** | | | | | | |
| No discussion | 22 | 181 | 1 | - | - | |
| Once | 80 | 83 | 7.9 | 4.63 | 13.59 | |
| Twice | 24 | 32 | 6.17 | 3.1 | 12.23 | <0.001 |
| Three times | 54 | 35 | 12.69 | 6.87 | 23.45 | |
| More than three times | 219 | 121 | 14.89 | 9.08 | 24.43 | |
| | | | | | | |
| **Husband approves the use contraceptive** | | | | | | |
| Yes | 353 | 232 | 7.16 | 4.84 | 10.59 | |
| No | 37 | 174 | 1 | - | - | <0.001 |
| Don't know | 9 | 46 | 0.92 | 0.42 | 2.04 | |
| | | | | | | |
| **Number of contraceptive know** | | | | | | |
| <2 | 41 | 85 | 1 | - | - | |
| 3-4 | 154 | 185 | 1.73 | 1.12 | 2.65 | <0.001 |
| ≥5 | 204 | 182 | 2.32 | 1.52 | 3.55 | |
| | | | | | | |
| **Discussion with HEWs** | | | | | | |
| No | 302 | 380 | 1 | - | - | |
| 1-2 | 24 | 21 | 1.44 | 0.79 | 2.63 | 0.008 |
| >2 | 73 | 51 | 1.8 | 1.22 | 2.66 | |

**Table 6.** Multivariate analysis on of factors associated with the use of modern contraceptives in Debre Birhan District.

| Explanatory variable | Contraceptive | | COR (95% CI) | AOR (95% CI) | p-value |
|---|---|---|---|---|---|
| | Yes | No | | | |
| **Desire for more children** | | | | | |
| Within two years | 35 | 166 | 1 | 1 | |
| After two years | 161 | 136 | 5.62 (3.65-8.63) | 5.71 (3.48-9.37) | <0.001 |
| No more desire | 203 | 150 | 6.42 (4.21-9.78) | 9.27 (5.43-15.84) | |
| | | | | | |
| **Number of living children** | | | | | |
| None | 30 | 67 | 1 | 1 | |
| 1-2 | 206 | 218 | 2.11 (1.32-3.38) | 1.132 (0.627-2.043) | |
| 3-5 | 150 | 137 | 2.45 (1.50-3.99) | 1.438 (0.744-2.777) | 0.009 |
| >5 | 13 | 30 | 0.97 (0.44-2.11) | 0.355 (0.131-0.968) | |
| | | | | | |
| **Husband approves use of** | | | | | |
| Yes | 353 | 232 | 7.16(4.84-10.59) | 2.82 (1.67-4.80) | |
| No | 37 | 174 | 1 | 1 | <0.001 |
| Don't know | 9 | 46 | 0.92 (0.42-2.04) | 2.50 (0.97-6.44) | |
| | | | | | |
| **Family monthly income** | | | | | |
| ≤300 | 97 | 116 | 0.59 (0.40-0.87) | 0.66 (0.38-1.12) | |
| 301-600 | 115 | | 0.47(0.33-0.67) | 0.54 (0.33-0.88) | |
| 601-927 | 63 | 74 | 0.60 (0.39-0.93) | 0.50 (0.29-0.85) | 0.038 |
| ≥928 | 124 | 88 | 1 | 1 | |
| | | | | | |
| **Discussion with the husband** | | | | | |
| No discussion | 22 | 181 | 1 | 1 | |
| Once | 80 | 83 | 7.90 (4.63-13.59) | 4.50 (2.15-9.42) | |
| Twice | 24 | 32 | 6.17 (3.10-12.30) | 4.10 (1.70-9.92) | 0.001 |
| Three times | 54 | 35 | 12.69 (6.87-23.45) | 5.99 (2.65-13.56) | |
| More than three times | 219 | 121 | 14.89 (9.08-24.43) | 7.32 (3.60-14.86) | |

## DISCUSSION

The need to have a well organized and coordinated birth control program for Ethiopia where its population increases alarmingly from time to time is an evident. Otherwise, its population is projected to reach 174 million by 2050 and become the 9th largest country in the world (Population Reference Bureau, 2009). A 6% reduction in contraceptive use among married women in the district also indirectly indicates that women's wish to have more children is still proactive in the area. The need for more children was the main reason for the discontinuation of modern contraceptive use that is also supported by findings from Dembia district, West Belessa, Khartoum, Cambodia and Pakistan (Beekle and Mccabe, 2006; Kebede, 2006; Ibnouf et al., 2007; Chourn, 2008; USAID Ethiopia, 2010). Thus, the culture of having more children as indicators of wealth needs relentless efforts from all potential stakeholders. Women

and other family members need to shift their mind in how to raise children as healthy as possible rather than bearing many children which is beyond the control of the family.

The proportion of women who use modern contraceptives in Debre Birhan district was found to be consistent with a previous study conducted in Ethiopia in the town of Nazareth/Adama (Biruk et al., 2008) but found to be better than other similar studies conducted in Dembia District (Kebede, 2006), West Belessa Woreda (Nega, 2008) and the National average contraceptive use (Central Statistical Authority, 2011). A difference in time of study may be the main reason for the discrepancies in study findings of similar studies beside that of residence, availability, accessibility and knowledge and attitude level of the respondents.

Findings of this study also revealed that the study participants used five different types of modern contraceptives and this mix of modern contraceptive

use was better than the previous study conducted in Dembia (Nega, 2008). A greater choice of methods increases contraceptive continuation and overall use of modern contraceptive methods including quality of services (Population Reference Bureau, 2009). In addition, the preference of long acting contraceptives particularly Inter uterine device (IUD) was higher unlike pills preference in contrast to a study done at Dembia district (Nega, 2008). This suggests that the possibility of using long acting contraceptives in the district is promising. Use of pills where many of the users complain about its side effect and claimed to cause unintended pregnancies may get substituted in the near future, and long acting contraceptives on the other hand may become first choices of women in the district. Such an improvement in the use of long term acting contraceptives is of course consistent with a study conducted in Khartoum, Sudan, where the use of long-term modern contraceptives showed an improvement as compared to short acting contraceptives (Ibnouf et al., 2007).

Child spacing was found to be the main reason for the women to use modern contraceptive, consistent finding with the study in Khartoum (Ibnouf et al, 2007). This can also tell that the thought of women to have more children was as it is. If it were limiting the number of children, it would show to what extent they were interested to raise a limited number of children in appropriate manner. Spacing children does not exclusively reveal women's initiation of limiting their birth. Taking the current living standards of the country and the corresponding life challenges, birth limit would not be their primary reason. Therefore, both govern-mental and non-governmental organizations working in the area of reproductive health need to work intensively to bring the agenda of 'limiting birth' on the table. Family members also need to determine the size of their family through open discussion and agree on which type of contraceptive shall be used. The proverb 'children grow by chance' shall be dodged from the minds of people through continuous education and promotion including reliable evidences and models from the developed world.

Factors that determine the use of modern contraceptives of course vary on the basis of the local situation (WHO, 2004). Results of this study also indicated that recent lack of interest to have children was a strong predictor of modern contraceptive use like the study findings of Cambodia and Pakistan (Chourn, 2008; Stephenson and Hennink, 2010). Discussion with the husband and their approval were another determinant factor for modern contraceptive use among married women in the district. Therefore, it is advisable for organizations working in the area of reproductive health to take such issues into consideration if their primary objective is to bring about significant changes within short period of time.

There are also other factors whose effect was diluted when adjusted for other variables; women's number of living children was among them. Despite the findings of this study different studies in Cambodia and Pakistan (Chourn, 2008; Stephenson and Hennink, 2010) suggested that the number of living children was an independent factor for the use of modern contraceptives. Religion, culture and perception/attitude may be the possible explanation for such variations. Similarly, those women who had more children in Debre Birhan may be at older age of reproduction and may perceive that they would have little risk of pregnancy.

Documented evidences within the country (Beekle and Mccabe, 2006; Mon, 2009) and abroad (Ali et al., 2004; Mekonnen et al., 2008; Abraham et al., 2010; Stephenson and Hennink, 2010) also showed that husband-wife communication had significantly improved contraceptive use. Women discussing modern contraceptive use with their husbands were more likely to use modern contraceptives, indicating that men's involvement plays an important role in the use of modern contraceptives. Therefore, actors in the area of reproductive health had been advised to involve male partners equally, as they are culturally empowered decision-makers of the family, particularly in Ethiopia where men are the main decision makers of all issues. The high chance of women to use modern contraceptives hiding from their partners could not be a means, as the effect would be seen in the short run.

Monthly income of a family was not found to be an independent predictor for modern contraceptive use despite available evidences in the literature, indicating that modern contraceptive use is associated with income level both in developed (Chourn, 2008) and developing countries (Ibnouf et al., 2007). Women with high socioeconomic status are more likely to use modern contraceptive than those women with low socioeconomic status. However, in this study, sufficient evidence depicting the relationship between income level and modern contraceptive use was not found when adjusted for other variables. The concept that having children is a gift from God may be the reason for the absence of statistical differences between women with higher and lower income level. Stakeholders have to work to change such attitudes and opinions across the district so that people start to appreciate the joy of having sensible family size.

Generally, with all the efforts of governmental and non-governmental organizations including the provision of family planning services free of charge, the proportion of modern contraceptive users in the district remained low. This indicates the absence of breakthrough efforts and actions in the area of empowering women and modifying cultural beliefs. Women have to know that using modern contraceptives is their right like other basic human rights and needs. All family members have to discuss reproductive health issues openly, and considering it, as a taboo in the 21st century needs to be stopped through diversified efforts and actions.

**Conflict of interest**

The authors have no conflicts of interest.

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