

GLUE SNIFFING AND HEALTH HAZARDS AMONG STREET CHILDREN: AN ERITREAN FIELD STUDY

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ABSTRACT

The present work is a field study that aims at providing base information on the use of bad behavior of glue sniffing and its problems as encountered by Eritrean street children. Forty children participated in the study, 78% of whom were males and 22% were females. They were individually interviewed according to designed questionnaire and their given responses were then analyzed. The obtained findings show that more than 95% of the children having families and that about 40% of the children live with their family and 55% are living in the street. Most of the children (95%) spending their time in street despite having families. Domestic violence, seeking employment, poverty, abuse and deprivation from education were the main reasons that caused them to leave their families. These children had tried tobacco, alcohol, glue, and/or benzene. The rate of glue sniffing among the studied children was found to be one boat/day. More than 70% of them were having preference to sniff in group. Pleasure, numbness, warmth, hallucination, unconsciousness, disturbance and disappointment were the major health problems encountered by the children. About 43% of these children have got sick after glue sniffing. More than 13% of them have been admitted to hospitals. Headache, nausea, vomiting, chest pain, palpitation and loss of locomotors skills were the immediate health problems encountered during their sniffing. More than 80% of the participated children know others who sniff glue, and also know the health problems that affect their glue sniffing colleagues. The action that should be taken by children after feeling sick is differ and ranging from nothing to do to go to the hospital. More than 73% of the children have the feeling that they became addicted. Attention need to be drawn for the authorities to the glue sniffing health hazards and to the necessity of collaborative societal works for containment of this bad behavior.

Keywords: Glue sniffing, volatile solvent health hazards, street children, Eritrea.

INTRODUCTION

The generic term “glue sniffing” is applied to the use of volatile solvents by inhalation. Abusing through intentional inhalation of the volatile organics is not a 20th century phenomenon. Volatile substances have been inhaled to alter consciousness since antiquity (Brecher, 1972). Scientific and lay literatures record that it occurred among the ancient Greeks at Delphi (Giovacchini, 1985).

The use of inhalants was recognized in early Greek and other civilizations as an adjunct to mystical experience and religious practice (Black, 1982). Kupperstein and Susman (1968) cite a report of an arrest of a child for glue sniffing in 1959. By the 1960s the habit had begun to spread, evidently eastwards across the U.S.A. from origins in California. Attention was drawn to petrol sniffing in the U.S.A. before World War II. The first epidemic of model aero-plane glue sniffing occurred in the U.S.A. in the mid-1950s, possibly as a result of publicity of a localized episode (Cohen, 1984).

Inhalant dependence and abuse have been reported from various parts of the world (Weir, 2001; Roman et al, 2003; Thiesen and Morros, 2004 and Wu et al., 2004). Also, concern about the extent of solvent abuse has now been indicated in many countries including Mexico, Japan, Sweden, Norway, and West Germany (Nicholi, 1983); South Africa (Moosa and Loening, 1981); South America (Watson, 1984); Hungary and Israel (O'Connor, 1983) ; Australia (Eastwell et al., 1983 and O'Connor, 1983); Singapore (Devathasan et al., 1984); Canada (Gellman, 1968) and France (Abgrall and Botta, 1983).

Inhaled substances generally fall into one of several chemical families including aliphatic hydrocarbons, alkyl halides, aromatic hydrocarbon and nitrates. Toluene and Xylene are the most common aromatic hydrocarbons of abuse found in many types of glue and solvents. Others chemical groups including ether and ketenes may also be used as inhalants. The popularity of inhalants (sometimes referred to as volatile substances of abuse) is greatest in the adolescent population, with a special preponderance among young teens. Some of the most commonly abused substances include glues, paints and lacquers, correction fluid, butane, and gasoline. Inhalants are appealing to adolescents for a variety of reasons. They are relatively inexpensive; legal; and readily available in homes, offices, supermarkets, hardware stores, and drug stores. The "high" achieved with solvents also occurs rapidly and disappears relatively quickly, compared with other drugs. Thus, a user can sniff after school and still return home sober (Cohen, 1977). The majority of these glue sniffing children are orphans and runaway children, who earn their livelihood by cleaning cars or works as child labor or "scavengers".

The universal effects of acute overexposure to solvents vapor is central nervous system (CNS) depression, producing effects ranging from dizziness and drowsiness to anesthesia and even death, depending on the level of exposure (Ridgway et al., 2003).

The first effect of inhalation is euphoria with excitatory effects probably due to disinhibition, but as the dose is increased the next stages are confusion, perceptual distortion, hallucinations and delusions, which may lead to aggressive and risk taking behaviors (Ashton, 1990). Sudden death from solvent abuse may result from anoxia, vagal inhibition, respiratory depression and/or cardiac arrhythmias (Shepherd, 1989). In some cases, inhalant users can be injured or killed due to hypoxia, pneumonia, cardiac failure or arrest (*Northern Territory Government 2006*), or aspiration of vomit. Some solvents can cause hearing loss, limb spasms, and damage to the central nervous system and brain (*Canadian Paediatric Society, 2006*). Death from inhalants is usually caused by a very high concentration of fumes. Incidences of death remain high relative to those for other drugs (Pfeiffer et al., 2006).

Forrest, (1985) and Rhital et al., (2002) stated that chronic use of volatile solvent damages the protective sheath around certain nerve fibers in the brain and the peripheral nervous system. NIDA's (National Institute on Drug Abuse) research report of 2005, mentions that inhalant

abuse cause neurological syndrome that reflects damage of parts in the brain that control cognition, movement, vision and hearing. Encephalopathy, characterized by euphoria, hallucinations, nystagmus, seizures, and coma (Lazar et al., 1983; King 1981 and Malm and Lying-Tunell 1980), and hyperchloremic metabolic acidosis, hypokalemia and acute renal insufficiency (Tsao et al., 2011), as well as kidney failure (Saxena and Ul-Haq, 2005) due to toluene abuse had also been reported. Ramsey et al., (1989) also, reported that some long-term abusers suffer permanent damage to the central nervous system, heart, liver and kidney. The widespread concern at the practice of solvent abuse arises because of the medical significance of the habit and because of the effects of solvent abuse on the behavior of the affected individual. Although these effects may be short-lasting, they can be incapacitating and possibly dangerous and even associated with criminal behavior. There is also the possibility of solvent abuse being associated with other forms of drug taking. Also, some reports point that children are forced to sniff glue and then directed for engagement in criminal activities.

This wide spread use of glue by adolescents and young adults and its consequences on the children's health and on the society have not been studied before in Eritrea.

The aim of the present work is to provide base information on the use of glue sniffing. This encompasses understanding the frequency, context and pattern of sniffing by the Eritrean street children as well as examination of the associated health problems. In addition, the present work aims to create an information base for further campaign strategies against this bad behavior.

MATERIALS AND METHODS

This work is a field study type of research. The study involved a lot of desk work and literature review, which was followed by preparing a questionnaire and interviewing the street children. With the help and guidance of the Ministry of Labor and Human Welfare we were able to reach out and locate such type of children who are in a boarding school in Dongolo Tahtai, 59 Km north east of Asmara, Semenawi kehieh bahri region.

The interviews were conducted there i.e. at Dongolo Tahtai. The Questionnaire consists of 20 questions out of which 14 were taken from the article (Rai et al., 2002) "Glue Sniffing among street children in the Kathmandu valley". The questions were prepared in a way so as to obtain the social and physiological circumstances of those children. They also included questions on the pathophysiological symptoms they had experienced and their sources of glue.

THE QUESTIONNAIRE

1) Age _____
2) Gender _____
3) Do you have a family?
Yes <input type="checkbox"/> No <input type="checkbox"/>
4) Where do you live?
With family <input type="checkbox"/> or in the streets <input type="checkbox"/>
5) If you live with your family where do you pass your day?
On the street <input type="checkbox"/> else where <input type="checkbox"/>

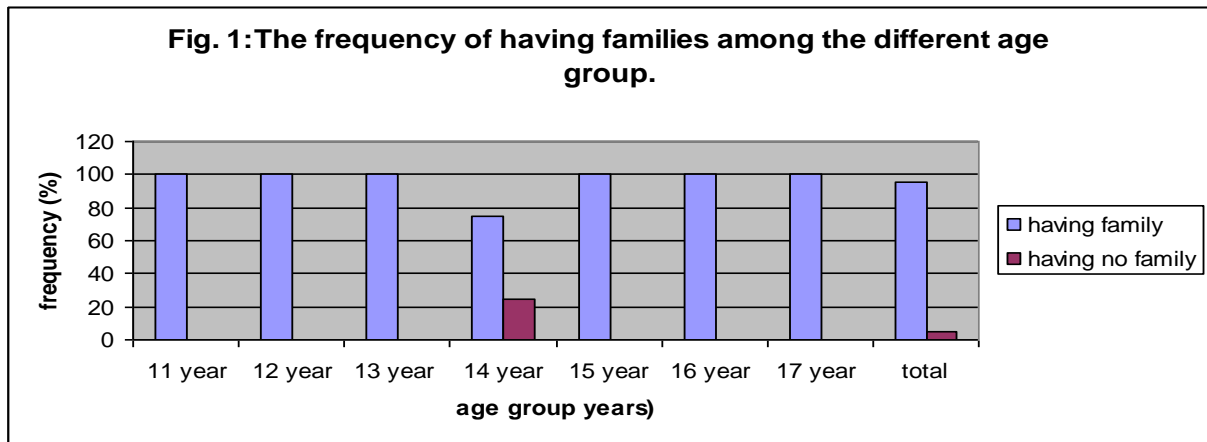
6) Why did you choose to live in the street or work in the street
Domestic violence <input type="checkbox"/> Seeking employment <input type="checkbox"/>
Lack of food <input type="checkbox"/> Deprivation from education _____
Peer pressure <input type="checkbox"/> Abuse and exploitation <input type="checkbox"/>
Just interested <input type="checkbox"/>
7) Have you ever used any of the following substances
Tobacco <input type="checkbox"/> Alcohol <input type="checkbox"/> Glue <input type="checkbox"/> Benzene <input type="checkbox"/> Other <input type="checkbox"/>
Yes <input type="checkbox"/> No <input type="checkbox"/>
8) If you sniff glue where do you get it
9) Do you sniff it when you are
Alone <input type="checkbox"/> In a group <input type="checkbox"/> If in group why <input type="checkbox"/>
10) Do you have other friends /people who sniff
Yes <input type="checkbox"/> No <input type="checkbox"/> If yes how many <input type="checkbox"/>
11) Where do you get the glue?
Work factory <input type="checkbox"/> handy equipment shop <input type="checkbox"/> Friends <input type="checkbox"/>
12) How often do you sniff glue?
Daily <input type="checkbox"/> once a week <input type="checkbox"/> twice a week <input type="checkbox"/>
13) How long have you been sniffing glue?
1 month <input type="checkbox"/> 1 year _____,
14) What do you feel after sniffing glue?
Pleasure <input type="checkbox"/> numb <input type="checkbox"/> sick <input type="checkbox"/> psycho <input type="checkbox"/>
15) Have you ever gotten sick after using it?
Yes <input type="checkbox"/> No <input type="checkbox"/>
16) Have you ever been to the hospital because of glue sniffing?
Yes <input type="checkbox"/> No <input type="checkbox"/>
17) What health problems have you encountered during glue sniffing
Headache <input type="checkbox"/> chest pain <input type="checkbox"/> stomach ache <input type="checkbox"/> Nausea <input type="checkbox"/> Other <input type="checkbox"/>
18) Have you seen anybody you know get sick because of glue sniffing?
Yes <input type="checkbox"/> No <input type="checkbox"/> if yes then what's the nature _____
19) What do you do after feeling sick?
20) Do you feel addicted to it?
Yes <input type="checkbox"/> No <input type="checkbox"/>

The participated children in this study were classified into seven age-groups. They were 11, 12, 13, 14, 15, 16 and 17 year's old group. Each group of children was studied separately.

RESULTS AND DISCUSSION

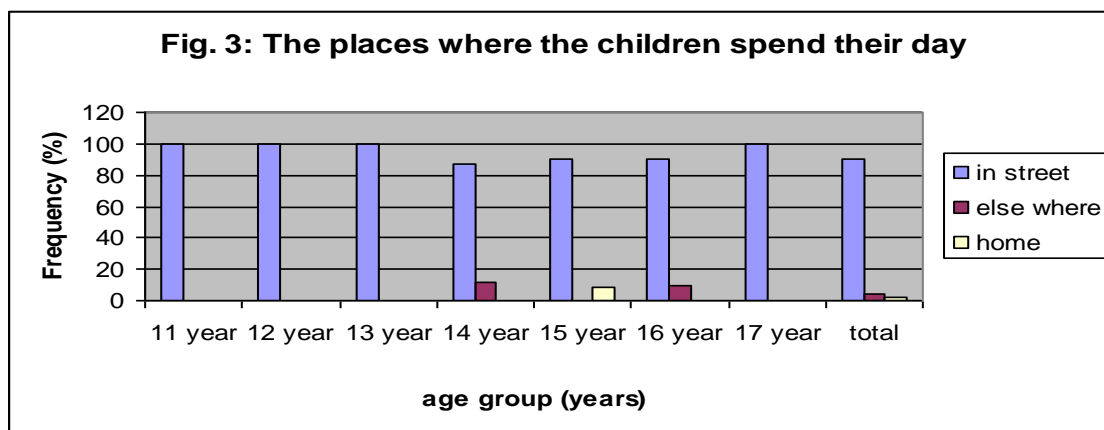
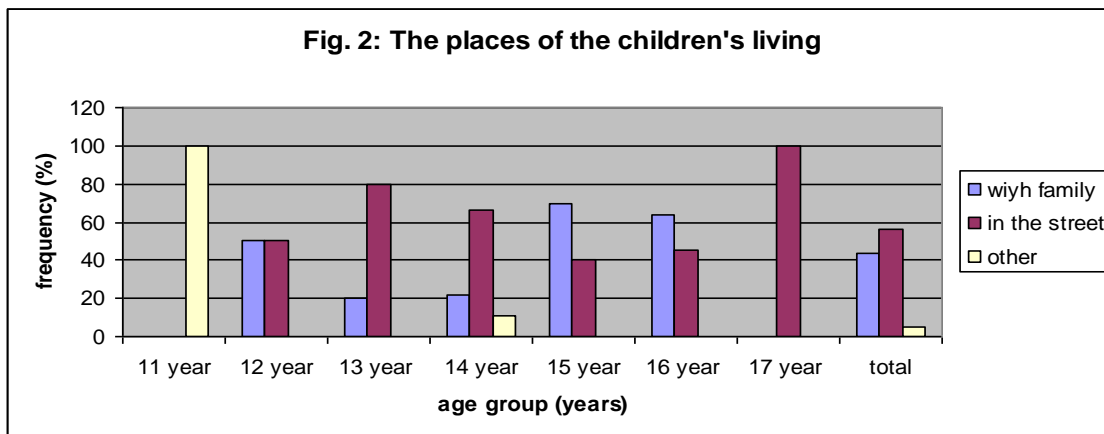
The total number of subjects participated in this study were 40 children. They represent the total number of children in the school at Dongolo Tahtai. About 78% of them are males and 22% are females, where the ratio of males to females was 3.59:1. Involvement of females in glue sniffing activity was also reported by Tulsidas, (2010) and Pearson et al., (1994). The study of Tulsidas (2010) reported an increase in the use of glue sniffing and that 70% of the studied participants were students under age of 20 out of whom 80% were males. Pearson et

al., (1994) mention that epidemiologic studies that were conducted more than 20 years ago showed that more than 50% of chronic solvent abusers were females in their prime childbearing years.



The current study revealed that most of the children how have experienced glue sniffing had families (figure 1), where more than 95% of them had families and only less than 5% hadn't. This reality is strange. It should be examined carefully by the relevant specialists, as the role of these families and their responsibilities toward their children are questionable.

The places of the children's living and the places where they spend their day are illustrated in figure 2 and 3, respectively.



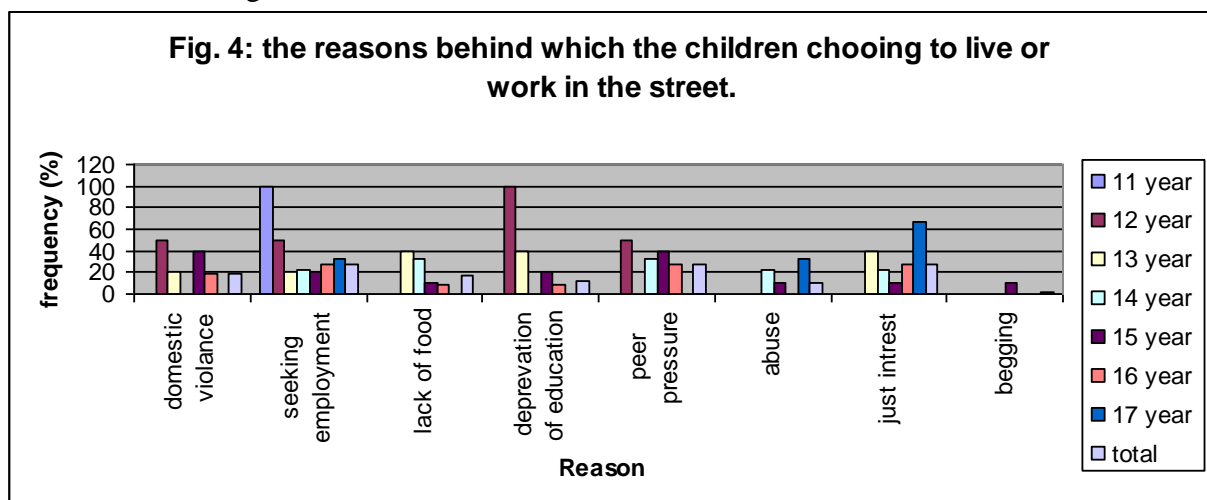
The findings illustrate that the number of children living with their families is more or less the same number as those who live in the street, in spite of having Families (figure 2). Figure 3 on the other hand, reveals that, most of the children (about 90.5%) were spending their day time in the street irrespective of the availability of their home. This finding is difficult to explain, unless we considered these children as street children according to the definitions stated by many organizations. Juillet, (2010) defined of street children as "A street child, whatever the country of origin, is a minor, fully cut off from their family, who must struggle to survive". Richter (1988) defines the "children of the street", as children who "have abandoned (or have been abandoned by) their families, schools and immediate communities, before they are sixteen years of age, and [have] drifted into a nomadic street life". Donald and Swart-Kruger (1994) make difference between children who live on the street ("children of the street") and those who earn money on the street for themselves and/or their families ("children on the street"). Also, United Nations Children's Fund (UNICEF, 1986) has classified street children in three major groups

- a) Children at risk- those who live in families but work on the streets to supplement the family income.
- b) Children on the street- those who have family support but work on the streets.
- c) Children of the street- those who work and live in the street without any family support.

The United Nations definition of the street child means any girl or boy for whom the street is the widest sense of the word (including unoccupied dwellings, wasteland, etc.) has become his or her habitual abode and/or source of livelihood, and who is inadequately protected, supervised, or directed by responsible adults" (International Catholic Children's Bureau, 1985).

On the other hand, this unexplained behavior namely living in the street, clarifies the existence of a big gap between the children and their families, and indicates that families may be unwilling to take care of their children, the situation that need great attention and wise societal and sociological interventions.

The reason(s) behind which the participated children left their home and went to the street was illustrated in figure 4.



The findings illustrated in this figure address most of the reasons that lead children in any part of the world to go to street. Rai et al., (2002) and Pinheiro, (2006) stated these reasons as domestic violence, conflicts in the family and alcoholic father. Some children left home in search of employment (Faulk, 2010), while others were influenced by their friends (Stiffman, 1989). Also, Faulk, (2010) and Plummer et al., (2007) mentioned that some children left home because of poor conditions and inadequate education in the valleys.

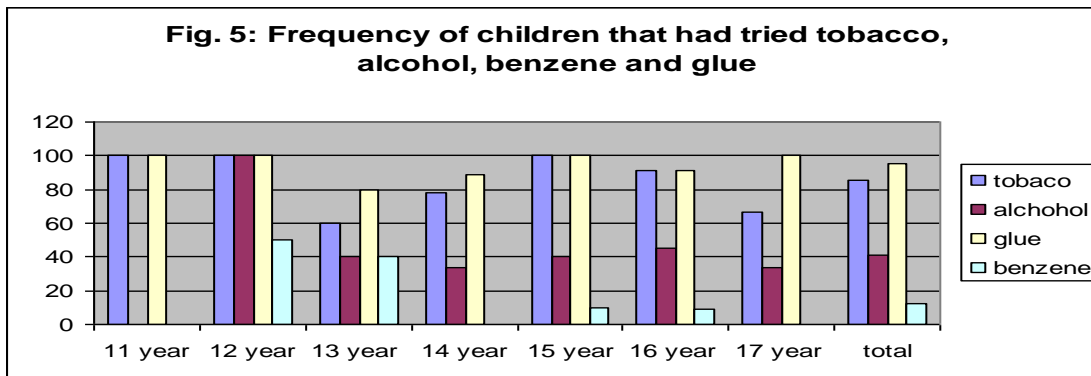
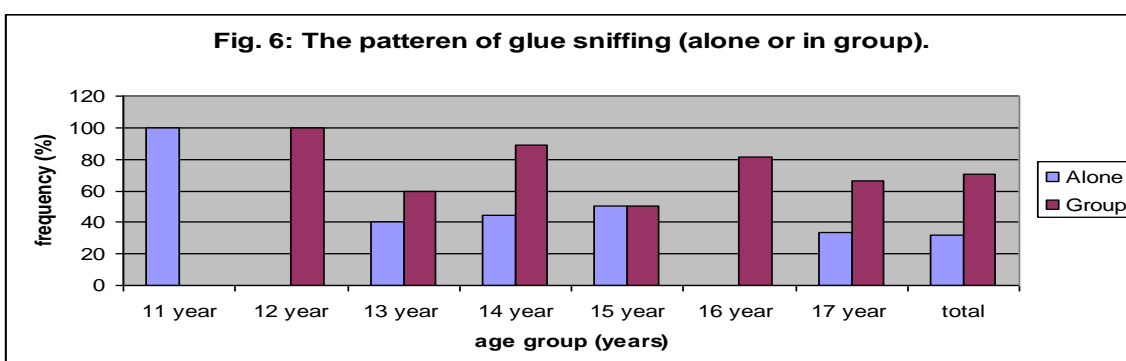


Figure 5 enumerates the different types of substances that were tried by the children and the frequency of use. It shows that glue sniffing and tobacco have the highest rate of abuse. Tulsidas, (2010) revealed that glue sniffing is often a stepping stone to harder drugs. He pointed that it should therefore not be underestimated and that appropriate measure on its prevention and treatment ought to be addressed. Also, in the scientific report about Nepal glue sniffing among street children (Lafoux and Kayasth, 2008)), glue sniffing was considered to can be taken as an initiation to the use of other hard drugs. Similarly, Bennett et al., (2000) had mentioned that glue sniffing was a precursor of abuse of other illicit drugs.

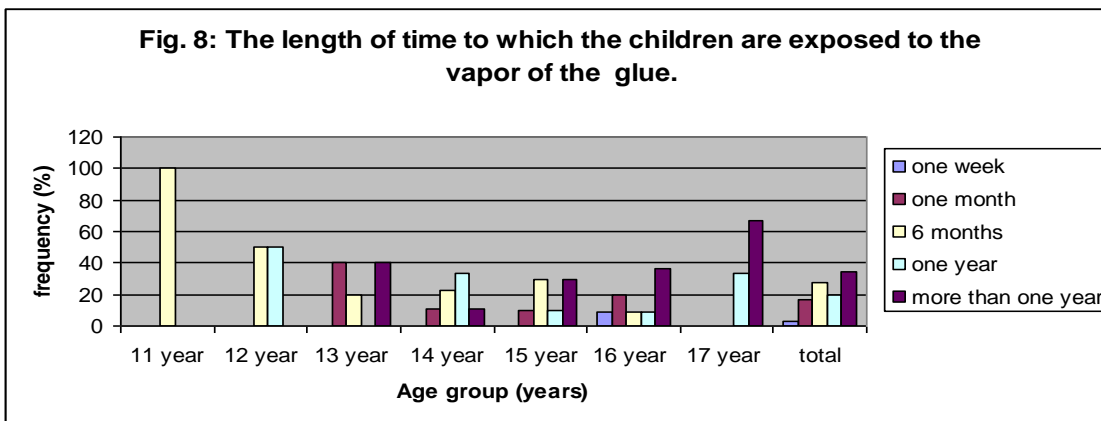
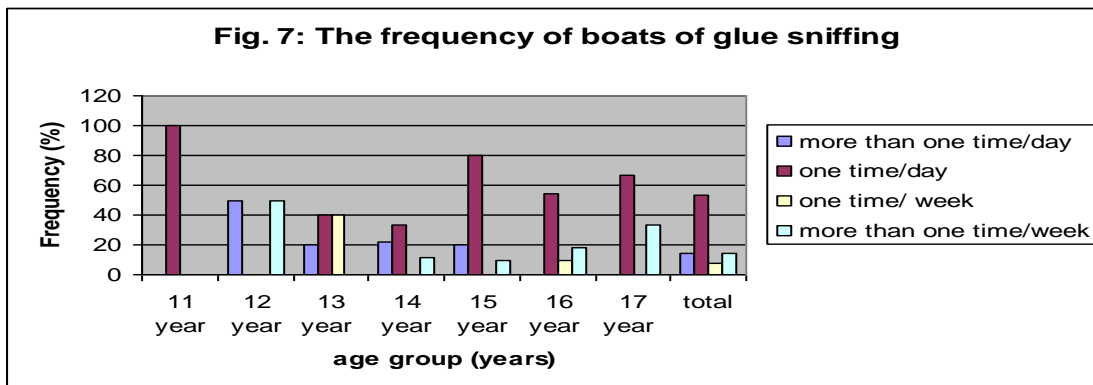
According to the findings of the present study, most of the studied children had got the glue from the cyclist shop. Moreover, more than 87% of them know the type of the glue and only 13% didn't know the type of the substance that they had sniffed. It is worth noting that the bicycle shop had been previously pointed as a source of glue to the children (Tulsidas 2010).



The patterns of glue sniffing were presented in figure 6. The obtained findings show that more than 70% of the studied children were used to sniff glue in group. This finding is more or less comparable to another work done in Nepal at 2008 by Lafoux and kayastha. This Nipal's study pointed that glue sniffing is mostly a group activity where 56% of the studied children never use glue alone while 38% sometimes use it alone and only 6% prefer to use glue while on their own. Similar finding had been reported by of Rai et al., (2002), where

majority of the respondents (95.1%) used to use glue with their friends. In the current study, children gave some reasons for such group activity. Some of the most important reasons were: feeling secure and protected, sharing, get the confidence and friendship.

The number of glue boats that were sniffed/unite time are illustrated in figure 7. This figure explores that about 60% of the children are used to sniff glue once per day. This figure comes in agreement with the study of Lafoux and Kayastha (2008), where 61% of the street children in Kathmandu sniff glue one time daily.



As illustrated in figure 8, more than 32% of the children participated in the present study were exposed to the vapor of glue for more than one year. This finding may indicate that the glue sniffing behavior among the street Eritrean children is still in its infancy and could be campaigned. But on the other hand, that matter should be considered an alarm to a more bad consequences, crimes and violations in the country.

The immediate health problems that were encountered by the children of 13, 14, 15, 16 and 17 years-old-groups were illustrated in table 1. This table reveals that numbness, warmth, hallucination, pleasure and psychosis disorders are the most prominent symptoms experienced and mentioned by all children.

Table 1: Health problems that were encountered by the children

Age group (years)	Type of health problems encountered									
	Pleasure	Numbness	Drunk	Warmth	Sleep	Hallucination	fighting	Being strong	Psychosis	Imagining
13 years	+++	+++	+	+++	+	+	+	+	+	+
14 years	+++	+++	++	++	+	+	+	+	++	+
15 years	++	++	+	+		+		+	+	
16 years	++	++	+	++		+			+	+
17 years	++	+++	++	+		+			+	

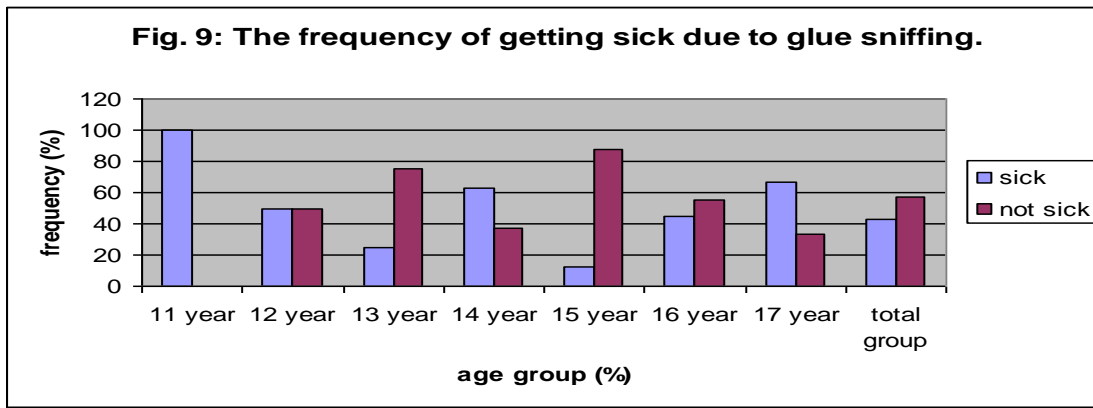
Many of these symptoms that are mentioned by the children who are participated in this work had been reported in other works. In the study of Lafoux and Kayastha (2008), 59% of the children described their feeling and sensation like hallucinations and evasion from reality (to see animals, snakes, Gods, ghosts, family member in the sky, to feel like flying, to see star falling down, to feel the earth quake... etc). Other's (25%) said that they felt fearless (for fighting, stealing), shameless (for begging rag picking) and aggressive. Only 16% confessed that they felt relax and playful, sleepy without pain and hunger.

Adams and Morgan (2007), reported the immediate effect of inhalants to include dizziness, excitation, disorientation, loss of coordination, distortion of perception, cognitive impairment, hallucinations, tremors, lightheadedness, diminished sensitivity to pain, slurred speech and loss of inhibitions. Kurtzman et al., (2001) pointed that, glue sniffing cause an initial excitatory response followed by central nervous system depression.

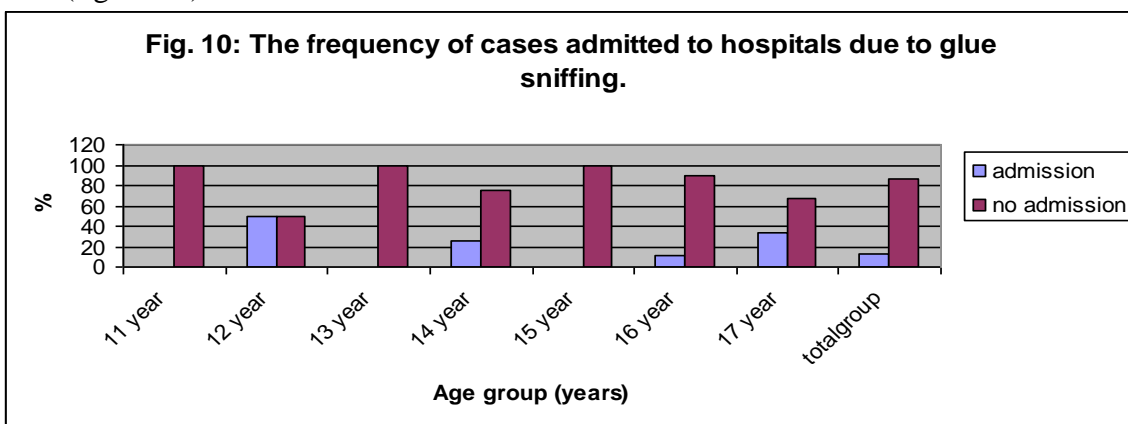
King et al., (1981) reported that glue sniffing cause incidence of encephalopathy that is characterized by euphoria, hallucination, nystagmus, seizure and coma. Toluene containing glue sniffing was found to produce activity, sleep and learning performance changes, electrophysiological and central nervous system effects (Benignus, 1981a). Also, high level toluene exposure was found by Benignus (1981b) to produce incoordination, ataxia, unconsciousness and eventually death, while lower level acute exposure produce dizziness, exhilaration and confusion.

WHO on the other hand, described the immediate effects of glue sniffing as feelings of happiness, relaxation, sleepiness, poor muscle coordination, slurred speech, irritability and anxiety as well as hallucinations and fits which can occur with heavy use (WHO, MODULE 3, Working with Street Children., Understanding Substance Use Among Street Children)

Figure 9 shows the frequency of children who experience sickness after glue sniffing, where about 43% of the children got sick after sniffing

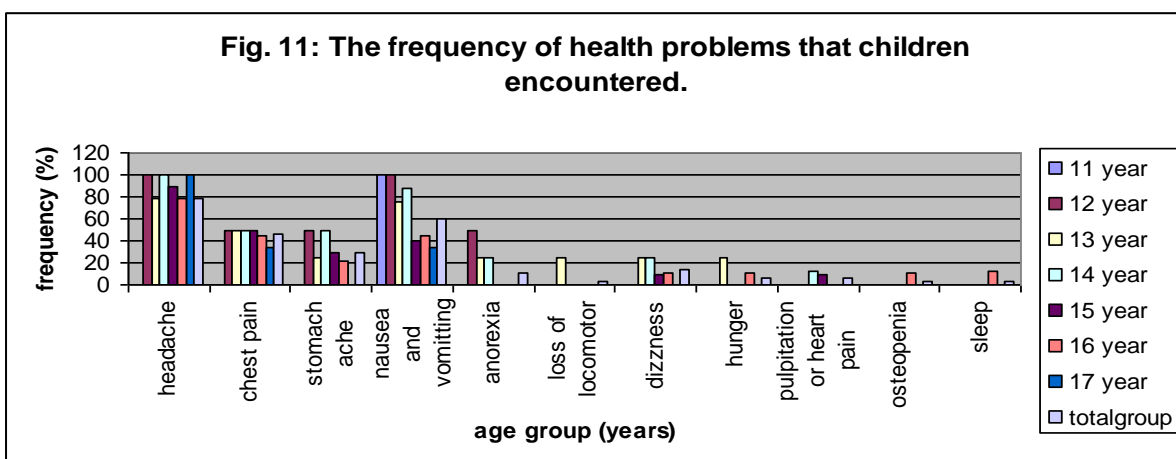


The frequency of the cases that were admitted to the hospitals due to glue sniffing was about 13% (figure 10).



This value is extremely high as compared with the value given by Uijen et al.,(2010) for the normal Dutch children where 1.8% (out of 80000 children participated in the study) was admitted to the hospitals for any respiratory diagnosis. On other hand, the incidence of hospital admission for the most frequent reasons for admission (acute upper respiratory tract infection, pneumonia & influenza and asthma) was 4%, 5.7% and 6.6%, respectively (Uijen et al., 2010).

The health problems that were encountered by the children during glue sniffing are explored and enumerated in figure 11.



This figure shows that headache, nausea and vomiting followed by chest pain and stomach ache were the most health problems encountered by the present children. Many of these problems had been documented by several studies on street children in many countries.

Midford et al., (2011) mentioned the progressive short-term effects of glue sniffing which include: feeling of wellbeing, disinhibition, hallucinations, nausea and vomiting, drowsiness, confusion, aggression, slurred speech, loss of coordination, blurred vision, loss of consciousness and death. Other immediate effects include: headache, abdominal pain, hyper-salivation and palpitations. Tulsidas, (2010) reported that repeated inhalation of glue among Singaporean street children had resulted in headache, slurred speech, diplopia, gait abnormalities, delusion, visual hallucination, and disorientation. He reported also that continued abuse resulted in further central nervous system depression manifested by drowsiness, seizures and even coma. Cough, stuffy nose, sneezing, flushing, salivation, nausea, vomiting, photophobia and sleep disturbances as well as sense of euphoria, excitation, dizziness, disinhibition behaviors and exhilaration have been also reported. On other hand, the U.S. Environmental Protection Agency (1994) reveals that repeated breathing of large amounts of toluene, such as when "sniffing", can cause permanent brain damage characterizes by problems with speech, hearing, and vision, loss of muscle control, loss of memory, and decreased mental ability. In another study conducted 1979 by Kaplan et al., it was mentioned that inhalant users may develop nausea, vomiting, diarrhea abnormal cramps. National Institute on Drug Abuse and National Institutes of Health, U.S, (2004) also, reported that inhalant toluene abuse can result in loss of appetite.

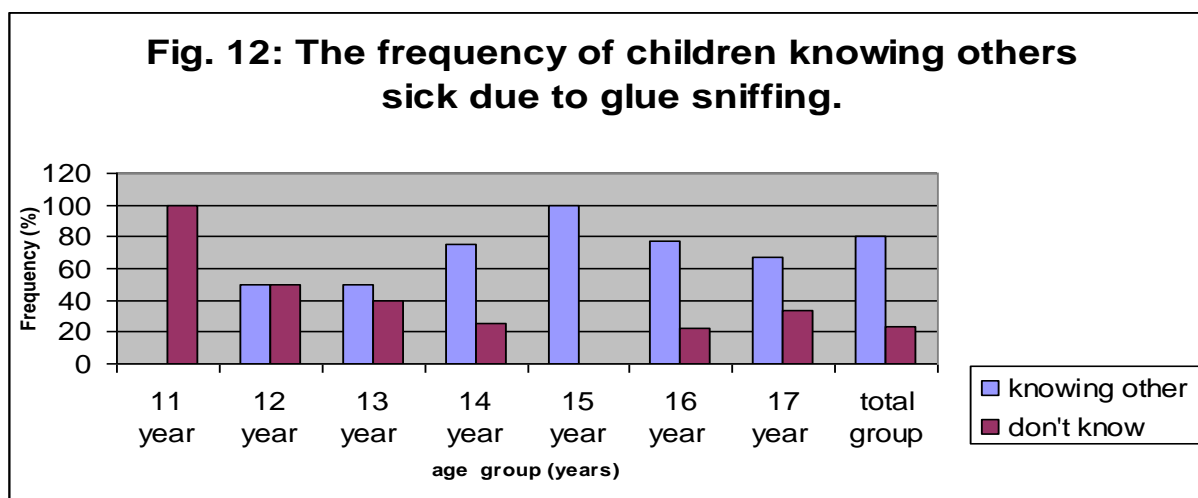
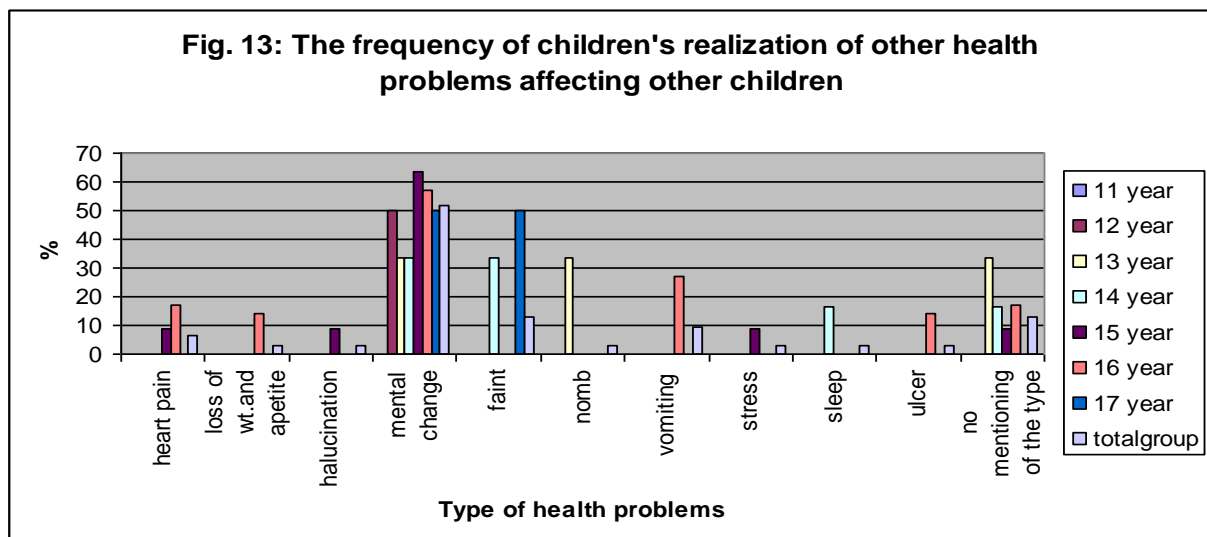


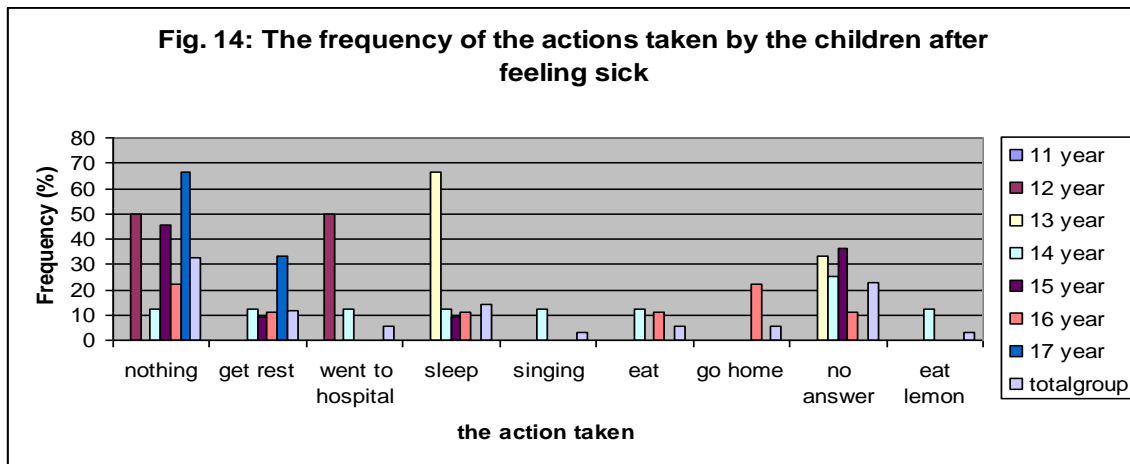
Figure 12 shows that about 80% of the children participated in this study knew other sniff glue children. This information fits with the culture and the environment of glue sniffing. A relevant finding in Nepal was that glue sniffing is mostly a group activity (Lafoux and Kyastha, 2008).



In the present study realization of the participated children regarding the suffering of their colleagues of health problems due to glue sniffing, did vary according to the children's age group (figure 13). In this respect, the most health problems mentioned by the children were mental changes, heart pain, faint and stress. These children-reported health problems find a support in other works, where Hormes et al., (1986) pointed that the central nervous system is the most vulnerable system affected by toxic inhalants. Also, Filley et al., (2004) reported that chronic glue sniffing cause neurological abnormalities that occur two or more years of regular abuse of toluene which has severe impact on the central nervous system myelin. In addition, chronic persistent abuse was suggested to be the cause of the permanent damage in some cases (Rosenberg et al., 1988). Cardiovascular chronic toxicity (Wiseman and Banim, 1987) and myocardial infarction due to toluene abuse had also been reported (The Official Newsletter of the California Poison Control System., 2013, Dail, 1990 and Cunningham et al.,1987).

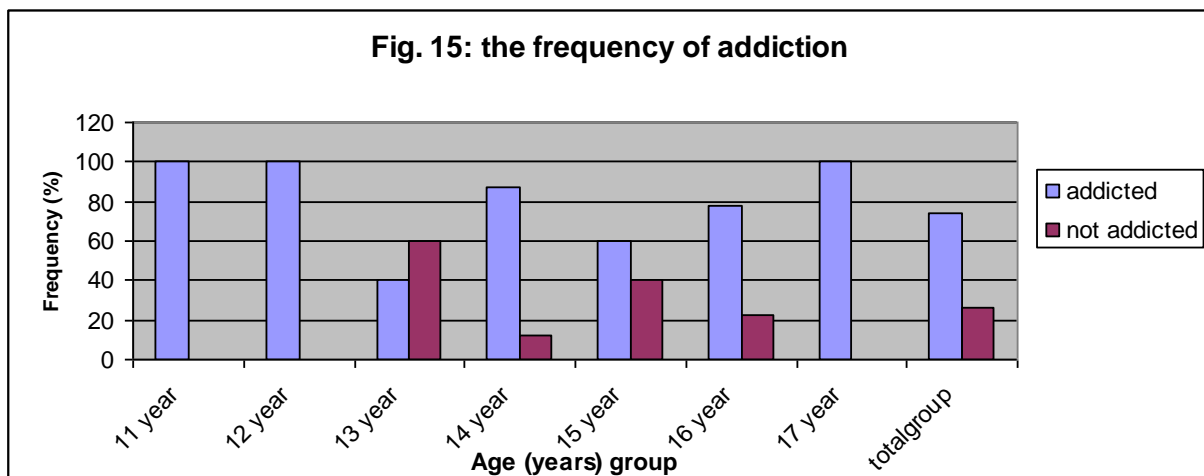
At the same time, this figure 13 shows that the children state that others suffer from stress, the condition that my find an explanation through the works of Howard and Jenson, (1999), Jacobs and Ghodse, (1988) and Edeh, (1989). These authors revealed that these adolescent often suffer from low self-esteem and are more prone to have depression and even suicidal thoughts.

About the action that can be taken by the children on feeling sick after they had practiced glue sniffing, was the findings as illustrated in figure 14.



This figure shows clearly inability to take a proper action. Similar finding was shown by Mahmud et al.,(2011) where glue sniffers were show to be less likely to seek professional medical assistance when they had a health problem. They were more likely to do nothing about the problem or opt for self-medication.

On the other hand, the children inability to respond properly towards their sickness may come due to their young age, shamefulness or unavailability of a suitable way to ask help, or being afraid to be arrested by the police or due to other circumstances. Such possibilities need to be assessed in more details by the relevant specialists.



At the end of the questionnaire, and as a response to the question “was you become addict?”, the answer of more than 73% of the children was “yes” (figure 15). In this regards, other works had been conducted in different part of the world showed that inhalant abuse can cause euphoric feeling and can be addictive (Anderson and Loomis, 2003). Similarly, relevant WHO report (Working with Street Children, MODULE 3) pointed that, the user has a strong desire to take the substance and cannot control its use. Actually long-term use increases tolerance as the body adjusts to the substance so that the same amount of substance no longer produces the effects. Accordingly, the addict may experience physical withdrawal reactions if he or she goes too long without the substance. The prominent reasons for addiction according to Rai et al., (2002) are the peer pressure and the easy availability of glue. The Rai et al study emphasized that since street children are community, highly influenced by beer; they are a high-risk group and may prey to the addiction at any time.

The inhalants produce many of the characteristics common to addiction (Adam and Morgan, 2007). For example, it has been found that toluene promotes euphoria in the brain in such the same way that cocaine, methamphetamine, and nicotine do. Inhalant abusers can build up tolerance, requiring increased amounts of the product to achieve the same effects, and some inhalant abusers have developed cravings, and symptoms of addiction. Heavy users may show withdrawal symptoms within several hours to a few days after use. According to Tulsidas (2010) inhalant abuse is prevalent and often an overlooked from substance abuse in adolescent and young adult. It causes a euphoric feeling that may lead to addiction and might cause a serious health concern associated with significant morbidity and mortality.

Eritrean children had to that moment intelligent mind; they can be good children now and forever. In the future they will be good, valuable and productive members in their country if the society takes the responsibility of these children's family. These children facing many problems in their life and to get away from them they have to sniff. For them, there is no alternative (due to their age). These children ask society not to exploit them nor look down on them they need only careful societal care and education through well trained specialists and teachers.

CONCLUSION

Glue sniffing among Eritrean children as a phenomenon is still in its infancy. The overcoming and containment of this problem demands organized societal effort and understanding the behavior of the children and the way for changing the thoughts and practices within the rapidly changing international circumstances. For such purposes:

- The respective cooperation of the specialists in the area of psycho-sociology and management are highly needed.
- Vitalizing the roles governmental and charity association(s) which can help the street children.
- Supporting association(s) that can educate the parents and the families how to take care of their children.
- Conducting campaigns in the schools to explain the long term consequences of substances abuse .
- Training the teachers to understand and practice their responsibilities towards the children.
- Establishing follow up strategies.
- Creating suitable control measures regarding selling of glue to underage children
- The cases admitted to hospitals due to glue sniffing should be recorded and examined by toxicologists the matters which help in better treatment and prevention of toxicity.

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CONFLICT OF INTEREST

The authors state no conflict of interest.

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