

Profile of solvent abusers (glue sniffers) in East Malaysia

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Abstract

Solvent abuse is deliberate sniffing of an organic solvent for the intention of altering the physiological state of the individual. It is also commonly known as glue sniffing because glue is the most commonly abused substance. This form of substance abuse is widespread throughout the world and usually popular among secondary school children and young adults because of its easy availability and it is cheaper compared with most drugs of abuse. In Malaysia this problem has been recognized especially among the children in East Malaysia. In this study, 37 children and young adults from or around Kota Kinabalu, Sabah were referred to Bukit Padang Psychiatric Hospital by the Anti-drug Task force for suspected solvent abuse. These children were interviewed using questionnaire and examined physically. Blood and urine were analysed for toluene and hippuric acid. 27 of the children, age ranging between 8 and 20 years, willingly admitted to sniffing glue for a period between a few months to 2 years. Most of them were children of Filipino illegal immigrants in Kota Kinabalu. Biochemical parameters were found to be normal. Two of them were pale with low hemoglobin and 7 had eosinophilia. Haematuria and proteinuria were found in 21 children (78%). 16 blood samples with toluene levels ranging from 0.3 to 41ug/ml and 10 urine samples have elevated urinary hippuric acid levels ranging from 1.2 to 7.4 mg/ml. Strong positive correlation was noted between mean blood toluene levels and duration of abuse.

Key words: glue sniffing, solvent abuse, toluene, hippuric acid

INTRODUCTION

Solvents have been recognised as one of the substances that can be abused especially by teenagers and young adults because of their psychoactive properties, easy availability and cheaper cost compared with drugs of abuse¹. This problem has been recognized worldwide especially in the United Kingdom². It is popular among teenagers in rural areas where other drugs and alcohol are not easily accessible. Glue is commonly being abused because most of them contained toluene which can produce an effect similar to alcohol intoxication, hence the term "glue sniffing" is usually used to describe the act, rather than "solvent abuse".

In Malaysia, this problem of solvent abuse has been recognized especially among the children around Kota Kinabalu. Information from the Anti-Drug Task Force suggests that this problem has started among school children in Sabah, usually among the immigrants. This problem is not so apparent in West Malaysia.

This study was undertaken in Kota Kinabalu, Sabah aimed at obtaining preliminary data on

glue sniffers especially about their personal and biochemical profiles and effects of sniffing to their health and well-being.

MATERIALS AND METHODS

Samples

Children and young adults who were suspected of being glue sniffers were referred to Bukit Padang Hospital in Kota Kinabalu, Sabah by the Anti-Drug Task Force officers during the study period of 4 months. They were interviewed using a prepared questionnaire and later a complete clinical physical examination was performed. 10 ml of blood were taken for liver function test, renal profile, full blood picture and for determination of solvent levels in the blood. Random and 24 hour urine samples were collected for full examination and microscopic examination and for analysis of hippuric acid which is a metabolite of toluene.

Apparatus and material

A Varian Model 3400 gas chromatography equipped with flame ionization detector was

used to analyze solvent levels in the blood using the headspace technique described by J.A. Bellanca as modified and evaluated in our laboratory³. The column used was 1m x 4mm i.d. glass column packed with Carbowax B 60/80 mesh, coated with 5% Carbowax 20M.

The chromatography system for detecting hippuric acid consisted of Varian model 5000 High Performance liquid chromatography (HPLC) equipped with Econosil C18 10µm, 150 x 4.6 mm column and Ultraviolet absorbance detector (230nm). The hippuric acid was extracted from urine using ethyl acetate as in the procedure described by Ogata et al and developed, modified and evaluated in this laboratory³. All reagents and chemicals used were either of HPLC grade or analytical grade.

SPSS version 9 was used to calculate the correlations and regression analysis.

RESULTS

A total of 37 children and young adults, all males, were referred to the Bukit Padang Psychiatric Hospital by the Anti-Drug Task force during the study period. These children were found in public parks or isolated and unused buildings in the act of sniffing glue or were present in a group where one or two were sniffing. Out of these, 27 willingly admitted to be or have been sniffing glue. The other 10 were allegedly merely watching their friends sniffing glue but did not try it themselves.

25 (93%) of those sniffing glue were children of Filipino immigrants or had a Filipino parent. The other two were locals but have befriended immigrants. 18 lived at Gaya Island, which has a settlement of Filipino immigrants, but they usually came to Kota Kinabalu during the day and returned there at night. The rest (67%) live in and around Kota Kinabalu.

Five (18%) of the abusers aged between 8 to 10 years old while 18 (67%) were between 11 to 15 years old. The rest (15%) were between 16 to 20 years old. It was also noted that this glue sniffing practice was done in groups. 63% of the abusers preferred to sniff the glue in groups rather than alone. This was because they can share one tin/can of glue among themselves. Only two of them preferred to practice alone, while 30% practiced both. The majority (93%) said their involvement were because of peer group pressure while the rest tried it out of curiosity. The popular glue being sniffed was the one used for wood adhesives (Jebsen or Kangaroo brand adhesives). These glue can be

obtained easily and sold in hardware shops for about RM2.00 for 100ml and RM5.50 for 300ml. The glue was imported from West Malaysia.

The most popular method used by the children in this study was by pouring about 10ml to 15ml of glue into a plastic bag. The mouth of the plastic bag was constricted and the concentrated vapour inhaled deeply through it by the abusers. Sometimes they would put the entire can or tin of glue into the bag and inhaled the vapour from it. The plastic bag was then passed around among the sniffers. For a new sniffer, one or two deep inhalations were enough to produce the desired effect, but chronic sniffers may need about 5 to 10 times of deep inhalations to get the same effect.

70% (19 out of 27) have been indulging in this practice for less than a year. They usually inhaled glue at the frequency of once per day or less, and their practice were not constant. They did not have any withdrawal symptoms even if they skipped the inhalation for a few days and some of them have stopped the practice altogether but still mixed around with their inhaler friends. 15% inhaled about 2 to 5 times a day and have experienced minor degrees of withdrawal symptoms if they abstained for a few days. Another 15% have been in the practice for more than a year. They have to sniff glue about 20 to 30 times daily to prevent the manifestation of withdrawal symptoms. The profiles of the sniffers are summarised in Table 1.

The principal effects felt by most (95%) of the abusers just after inhalation were feeling high, hallucination and euphoria (Table 2). Blurring of vision was felt by about 25% of them. Inhalation would continue until they became unconscious. The effect would usually last from a few minutes to an hour depending on the number of inhalations and the amount of glue inside the plastic bag. When they become sober, they usually experienced headache, loss of appetite and tightness of the chest.

Physical examination showed poor personal hygiene. Four of them had traces of glue on their clothes and faces and their breath smelt of solvent. Two of the chronic inhalers were found to be pale. Examinations of other systems including the central nervous system showed no abnormal findings.

Laboratory investigations showed normal liver and renal functions. Two of the chronic inhalers were pale with haemoglobin levels of less than 10mg% and their full blood picture showed iron deficiency anaemia. Seven of them had eosinophilia which ranged from 5% to 19%

TABLE 1: Profile of glue sniffers

		Number of sniffers
Ethnic group	Fillipino immigrants	17
	Local	10
Age (years)	< 10	5
	11 - 15	18
	16 -20	4
Period of Abuse	< 12 months	17
	12 - 24 months	8
	24-26 months	2
Frequency	1 - 2 times per day	24
	20 - 30 times perday	3
Amount of glue inhaled	$\frac{1}{2}$ to 1 tin/day	27
Method used	In group	27
	Both alone and in group	8
Reason	Peer pressure	25
	Curiosity	2

TABLE 2: Main symptoms experienced by glue sniffers

Symptoms	No.of abusers	%
Euphoria	13	48
Drowsiness	21	78
Hallucination	19	70
Blurring of vision	7	26
Headache	27	100
Loss of appetite	27	100

of the total white cell count. Urine examination revealed presence of blood and protein in 21 (78%) who have been sniffing glue for more than six months. More protein and blood were found in the urine if the period of abuse was longer.

Analysis of blood for solvents and urine for hippuric acid showed that 16 (59%) of 27 who admitted to inhaling glue had toluene in their blood ranging from 0.1ug/ml to 41ug/ml. The level of hippuric acid in their 24-hour urine samples ranged from 0 to 7.4 gm/ml . Mean toluene levels in blood and hippuric acid levels in urine in relation to period of abuse and frequency of sniffing is shown in Table 3. Toluene and hippuric acid were not detected in 11 of the sniffers. Analysis of blood and urine

from 10 children who did not admit to sniffing showed that 2 of them had toluene in their blood. Pearson correlation study using SPSS (version 9) showed a positive correlation of 0.810 ($p < 0.01$) between mean toluene level and duration of abuse and positive correlation of 0.515 ($p < 0.05$) between mean toluene level and mean hippuric acid level. Correlation between mean hippuric acid level and period of abuse was not statistically significant.

DISCUSSION

Our results showed that the glue sniffers were mainly from the Fillipino immigrant community (93%) and most of them live at the Gaya Island. The practice may have spread to local children since the sniffing usually occurred at public

TABLE 3: Mean blood Toluene levels and urinary Hippuric acid levels in sniffers

Period of abuse (months)	Number of sniffers	Mean Toluene level (ug/ml)	Mean Hippuric acid level (mg/ml)	Frequency of sniffing per day
0 to 2	16	0.33	0.942	0.5 – 1 times
>2 to 4	3	1.9	0.567	0.5 – 1 times
>4 to 6	4	5.73	1.475	2 – 5 times
>6 to 12	3	10.7	11.7	20 – 30 times
>12 to 24	1	41	2.4	20 - 30 times

areas and were easily observed by local children. Peer pressure was the main factor for their involvement and glue was the only substance sniffed. Other personal profiles of these sniffers, the effects they felt and the method used were similar with observations overseas^{2,4}.

The euphoria and hallucination produced by toluene showed that this solvent has effects on the central nervous system that controls the psychological state of the individual. It also produced dependency manifested by the appearance of characteristic withdrawal symptoms after a period of abstinence. The increase in frequency of sniffing suggested that tolerance was being developed to this substance.

Liver profiles were normal in the chronic sniffers in this study. Toluene is known to be excreted rapidly by the lung, while some remained at the adipose tissue and is released slowly to be metabolised by the liver to hippuric acid. It appears that the load on the liver was not heavy but prolonged sniffing may burden the liver resulting in liver impairment. Hydrocarbons, particularly toluene, have been implicated but not conclusively shown to cause liver damage⁵.

Carlisle et al⁶ showed that overproduction of hippuric acids resulting from the excessive inhalation of toluene plays a role in high anion gap metabolic acidosis and tubular damage leading to renal tubular acidosis which can progress to renal failure. In our study, haematuria and proteinuria were found in 78% of sniffers who have been sniffing for more than 6 months. In the absence of other obvious causes this could be attributed to either glomerular or tubular renal damage caused by the acid. This is notable given the observation that the amount of protein and blood in urine directly correlated with the duration of abuse. Although the renal function was still normal, there is a possibility of developing subsequent renal failure with prolonged abuse.

The low hemoglobin level in 2 of the chronic sniffers could be due to lack of proper nutrition or chronic loss of blood in the urine as a result of tubular damage. Worms or parasitic infestation could also cause anaemia. A detailed dietary history and stool analysis to exclude parasitic infestation should be done before attributing glue sniffing as the cause of anaemia.

Many studies reported the presence of eosinophilia in glue sniffers^{7,8} and our study showed 7 (25%) of them have it. However, other causes of eosiniphilia especially parasitic infections and allergic condition have not been ruled out. Hence, glue sniffing could not be attributed as the only probable cause of eosinophilia in this study.

Strong linear correlation between duration of abuse and mean toluene levels suggests accumulation of toluene in body tissues with prolong and frequent sniffing. Toluene is soluble in lipid rather than water, so it stays longer in organs or tissue with high content of lipid, like the myelin sheath, nerve fibres and brain. Thus there is potential injury of these tissues with chronic abuse. Many studies have shown the occurrence of peripheral neuropathy, and various other effects on the brain in chronic glue sniffers^{8,9,10}. Unfortunately in our study a detailed and thorough examination of the central nervous system including brain scan was not performed on the sniffers.

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