

SOCIODEMOGRAPHIC AND ENVIRONMENTAL CHARACTERISTICS, AND POTENTIAL HEALTH RISKS, OF SCAVENGERS IN OPEN MUNICIPAL DUMP SITES IN NAKHON RATCHASIMA PROVINCE, THAILAND

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ABSTRACT: Despite increased efforts to prevent, reduce, and recycle waste, the appropriate management of municipal solid waste (MSW) remains a major environmental health issue. The present study investigated the demographic characteristics, physical environments, health risk behaviors, and the health situation of local scavengers in open dump sites at Nakhon Ratchasima province, northeastern Thailand. Behavioral and health information was obtained from 121 randomly selected dump sited scavengers. A standardized preset questionnaire was developed and face to face interview was carried out to collect the information. Work characteristics and physical environmental characteristics were recorded on observation forms. Municipal solid waste (MSW) composition was measured and calculated. Scavengers were 52% male and 48% female, and the average age was 41 years. Most of them had been scavengers for more than 9 years and had little education, ranging from uneducated to primary level. They worked 6-8 hours/day, 5-7 days/week, with an average income of 262 Baht/day (about \$8.50 US/day). Some scavengers used personal protective equipment (PPE) such as gloves, hats, shoes, long-sleeve shirt, and long pants. However, they rarely cleaned hands or body after working. Most of them consumed food and drinking water at the dump sites. 36% reported injuries or accidents at the dump site in the past year. Some physical symptoms such as headache, muscle pain and exhaustion were reported from the scavengers. They even did not report about their severe illness. About 47% of them smoked and did not do exercise. Although many health facilities were provided by Ministry of Public Health in the nearby health centers, only 29% of them had done annual medical checkups. Most scavengers were regularly exposed to poor ventilation, dusty conditions, bad odors, high temperatures, and direct contact with disease-causing animals.

Keywords: Municipal Solid Waste (MSW), Scavenger, Behavioral Risk, Health Impact, Waste Composition, Nakhon Ratchasima province

INTRODUCTION

Solid waste has been becoming an important problem faced in daily life, especially by people in large cities. The Pollution Control Department reported in 2006 that annual nationwide amount of solid waste was about 14.63 million tons (40,082 tons/day). Between year 2007 and 2010 it was increased from 40,333 tons a day to 41,532 tons a day [1, 2]. The amount of solid waste has increased with continuing development and increasing consumption. It is expected that the nationwide amount of solid waste will be about 47,000 tons/day in 2012. National solid waste management policy emphasized community participation and undertakes to control solid waste problem at the source [1]. Solid waste management systems often operate to low standards. They can be unreliable, provide inadequate management coverage, and may

country cities often collect only 50-80 % of waste generated, with open dumping the only disposal method available [3]. Insufficient collection, uncontrolled street collection points and improper disposal in open dumps allow refuse to be readily available for informal waste recycling through scavenging (waste picking). Waste picking is the informal extraction of recyclable and reusable materials obtained from mixed waste. Scavengers collect waste materials and add value to them by sorting, cleaning, altering the physical shape to facilitate transport, or by collecting them into large quantities that can be sold. Scavengers occupy a low social position, and their income is generally very low [4]. Uncontrolled land filling practices and associated problems of municipal solid waste (MSW) disposal is a growing environmental and public health concern in the developing world. In India, about 50 million tons of MSW is collected by the civic authorities every year, 90% of which is dumped in low-lying area at the outskirts of the

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cities [5]. Landfill sites in India receive all kinds of garbage, including food wastes, dead animals, plastics, rubber, chemical wastes. In addition, health-care wastes including used needles and syringes are often dumped in landfill sites in contradiction to the Government's rules requiring separate disposal of biomedical wastes [6]. The wastes are dumped and spread in an uncontrolled and uncovered manner, causing great public nuisance. Installation of appropriate systems for urban waste disposal in developing countries is delayed for several reasons such as non-availability of appropriate technologies, absence of professional training, and inadequacy of funds [7].

Thailand lacks basic epidemiological data on the health impact of prevailing waste management practices that could motivate and drive the authorities to adopt safer management techniques. Despite increased efforts to prevent, reduce, reuse and recycle waste, the appropriate management of municipal solid waste (MSW) remains a major environmental health issue. Nakhon Ratchasima Province is located in northeastern Thailand. It has an area of around 20,494 square kilometers. The province is subdivided into 32 districts (Amphoe). The districts are further subdivided into 287 sub-districts (Tambon) and 3,743 villages (Muban) and a population of 2,565,117 [1]. Solid waste is an important environmental problem in the province. In 2006 reported by the Pollution Control Department amount of solid waste is about 204.44 ton a day, expected to increase to 1,308 ton a day in 2011 inside the municipality [1]. The government encourages recovery of solid waste. Thus, the number of waste scavengers is expected to increase. Further characterization of scavengers' work situation, environmental exposures, and environmental health risks is therefore very important. The purpose of the present study was to assess these factors in dump site scavengers in Nakhon Ratchasima.

MATERIAL AND METHODS

Study area and subjects

This study was a descriptive survey done at the municipal solid waste disposal open dump sites in Nakhon Ratchasima Province. The study was performed on behavioral and health status among 121 scavengers working in dump site. Nine dump sites were randomly selected for study from the 32 dump sites in Nakhon Ratchasima Province. Every scavenger of these 9 sites was invited to participate in the study.

Measurement tool

A cross-sectional study was conducted, using a standardized questionnaire. This was a modification of a questionnaire that had been previously used among waste pickers in six provinces of Thailand [8]. In order to determine health statuses were information was obtained with face-to-face interviews, about their demographic, occupational

Table 1 Social and demographic characteristics of the scavengers in the study

Characteristic (n = 121)	n	%
Gender		
Male	63	52.0
Female	46	48.0
Age (Year)		
≤30	26	21.4
31-40	30	24.7
41-50	32	26.4
51-60	25	20.6
>60+	8	6.6
Mean±S.D (range 14-80 years)	(41.41±13.17)	
Marital status		
Single	8	6.7
Married	105	86.7
Widow	4	3.3
Divorce	4	3.3
Education		
Uneducated	16	13.2
Primary school	87	71.9
Secondary school	12	10.0
Under bachelor degree	6	4.9
Monthly income (Baht)		
<3,500	15	12.4
3,500-5,000	36	29.7
>5,000-10,000	52	43.0
>10,000	18	14.9
Mean±S.D	(5,660±2038.84)	
Financial condition		
Debt	80	66.1
No debt	33	33.9
Residence		
Rented	15	12.4
Live with relative/friend	12	10.0
Own home/family	73	60.3
Temporary shelter at dump site	11	9.0
Other	10	8.2

* 1 USD was approximately = 30.8 THB

information and health status and behavior, health information access, and health services and welfare access. An observation form was used to record information on scavengers' working environment (i.e. light, noise ventilation, dust, odor, heat, and animals), health risk behavior, and self-protection. A solid waste component form was used to survey the quantity and components of solid waste in the dump sites.

Data analysis

Data were analyzed using R Program, version 2.12.2. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to summarize and describe the data.

RESULTS

There were 172 eligible scavengers however only 121 respondents (70%) participated in the questionnaire interview. Table 1 shows that 52% of participants were male and 48% were female with an average age of 41 years. Most of the participants (87%) were married and 72% were educated at primary school level followed by 13% with

Table 2 Occupational health information and health risk behavior of scavengers in dump sites

Characteristic (n = 121)	n	%
Duration of work		
Mean±S.D	(9±9.48)	
Reason to do the job (may answer more than 1)		
Provide more money	85	70.2
No need initial investment	103	85.1
Suggestion from neighbor	11	9.1
Family business	14	11.5
Other	3	2.5
Satisfaction with the job		
Satisfied	111	91.7
Neutral	9	7.3
Unsatisfied	1	1.0
Routine working		
Day per week (min-max = 4-7)	6	
Hours per day (min-Max = 6-12)	8	
Self protection attire		
Never	5	4.1
Sometime	61	50.4
Every time	55	45.5
Personal Protective equipment (PPEs) use*		
Glove	105	86.8
Cap/Nest	92	76.0
Mask	41	33.8
Glasses	4	3.3
Boot/shoe	106	87.6
Long sleeve shirt	110	91.0
Pants	112	92.6
Injury or accident in past year	43	35.5
Clean practice after work		
Immediately after finish work	30	24.8
After back home	91	75.2

* answer more than one

uneducated and 15% with secondary school or higher education. An average monthly income of the participants was 9,000 baht (about \$292 US) and the average family size was family members of 4 persons (of whom 2 were dependents). 66% of them had financial debt, 60% live in their own homes, 12% rented, 10% lived with a relative or friend and 10% lived in temporary shelter at the dump site.

Health Information

Table 2 shows occupational health information and health risk behavior of the scavengers. Most of the participants had been working as scavengers for more than 9 years. The main reason why there were working for this job were no need initial investment (85.1%) and provide more money (70.2%) Around 92% of them felt satisfied with the scavenging work with neutral 7% and unsatisfied 1%. Routine work hours were in the range of 6-12 hours/day and for 4-7 days/week. Types of solid waste they had collected were paper, glasses, plastic containers, metal and organic waste. About self-protection attire 4% never used any protection followed by sometime 50% and every time 46% respectively. Regarding the personal protective equipment, gloves was used by 86% of participants followed by cap 76%, mask 34%, glasses 3%, boot/shoe 88%,

Table 3 Health information, health care services access and welfare, health behavior, mental and social health

Characteristic (n = 121)	n	%
Status of illness		
Have ever been ill (in last 3 month)		
No	109	90.0
Yes	12	10.0
Medical checkup (annual)		
No	86	71.0
Yes	35	29.0
When get sick		
Self medication	75	62.0
Traditional medical practitioner	5	4.1
Private clinic	16	13.2
Government facility	25	20.7
Symptomatic drug use		
No	92	76.0
Yes	29	24.0
Health service facility access	121	100
Type of health insurance		
30 baht scheme	118	97.5
Social insurance card	1	0.9
Other	2	1.6
Health Risk Behavior		
Smoking	41	33.8
No	4	3.3
Yes	106	87.6
Alcohol drinking	110	91.0
No	112	92.6
Yes	43	35.5
Energetic drink		
No	30	24.8
Yes	91	75.2
Hours of sleeping per night		
Mean±S.D.	(6.65±1.18)	
Taking food in workplace	47	38.8
Main drinking water from		
Buy	44	36.4
Well	1	0.8
Pond	2	1.6
Rain water (bring from home)	74	61.2

long sleeve shirt 91% and long pants 92%. In the past year 36% had been injured at the dump site through accidents or cuts with sharp objects. After work 25% cleaned themselves immediately where as 75% cleaned after arrival at home.

Health history

Data of Table 3 shows the participants status of illness. The participants who had never been ill in the last 3 months was 90%, annual medical checkup was done by 29%, 62% participants used of self-medication where as 21% were using public health government facilities and 13% were using private clinic. Likewise symptomatic drug was used by 24%, access to health service facility was 100 %. About health risk behavior, 59 of respondents were (47%) smokers among them 19% were female and 81% were male. Out of total participants 60 participants (50%) used alcohol drinking including 70% male and 30% female. 84% of the respondents used energy drink on the other hand 17% were involved in exercise. The participants were slept an

Table 4 Physical symptoms and emotional and social characteristics

Characteristic (n = 121)	n	%
Uncomfortable physical symptom (Symptom during working time)*		
Shortness of breath	35	29.0
Headache	59	48.8
Common cold/ cough	94	77.7
Numb and foot	19	15.7
Conjunctivitis	1	0.8
Vertigo/vomiting	16	13.2
Low back pain	118	97.5
Numb or cramp	8	6.6
Skin rash	83	68.6
Impetigo	61	50.4
Swelling	1	0.8
Tired and weak	26	21.5
Other	1	0.8
Emotional		
Work concentration	120	99.1
Sleeplessness or anxiety	1	1.0
Stress	2	1.7
Downcast	3	2.5
Facing problems directly	119	98.3
Family happy image	117	96.6
Religious Activity		
Every day	6	5.0
On religious holidays	70	57.8
Only occasionally	45	37.2
Social participation		
Election participation	112	93.3
Satisfy with neighbor and community	43	35.5

* May answer more than one

average of 6 hours per night. Regarding the food 38.80% participants took food to the workplace and 61.20 % of the participants used to bring water from the home.

Table 4 shows frequencies of physical symptoms and of emotional and social characteristics. 98% had problems with low back pain, 78% common cold and 69% had skin rash. Emotionally, most of them were normal, and about social health involvement they had took participation in political election and satisfied with the situation and community.

Observation of activities in dump site area

In average, those dump sites have been using for 15.56 years and all of dump sites were under responsibility of municipality and each municipality difference management for solid waste such as open dump, open dump and burn, landfilling. Scavengers worked in dump site they were regularly faced with adverse conditions such as vibration from machine, poor ventilation, noise, odor, overheating, waste water and disease-causing animals (rodents, reptiles, and flies). Some scavengers lived, cooked, and found food in the dump sites. Some of them did not use any PPE and some used only mask, gloves, boots for their work, and work with bending up and down,

Table 5 Components of solid waste

Component	Percentage
Organic waste	59.33
Plastic	5.60
Paper	3.40
Glass	2.30
metal	2.20
Hazardous waste*	0.17
Other	27.00

* Broken lamp, and spray can, battery, a dry cell for a flashlight etc.

pulling, and carrying loads on the back and shoulders.

Separation of solid waste components

In the nine dump sites there was an average solid waste amount of 27.17 tons/day (S.D. 55.98) (Range 3-176 tons per day) the solid waste component were 60% compostable waste, 13% recycle materials, 27 % non-compostable (specific components were 3.4% paper, 2.3% glass, 5.6% plastic, 2.2% metal, 59.3% organic waste, 0.20% hazardous waste, and 27% other in Table 5).

DISCUSSION

Scavengers working in municipality dump sites were likely to be exposed with various health risks while they were on duty. Scavenging was the participants' main occupation to earn money to take care of all of family members (average 4 persons per/household). For most, income was not adequate. Some of them had rented room or had temporary shelter at dump site for their residence. This was similar to another study in Mexico, which found that scavengers were perceived as the poorest of the poor and marginalized from the mainstream economy and society [9]. In the current study, most scavengers did not use PPE, some used bare hands for collecting solid waste and some of them incurred injury from sharp objects. They were not aware about personal cleaning, and waited until the job is finished each day. They worked in poor sanitation such as overheating, vibration, dust, poor ventilation, bad odors, and disease-causing animals [8, 10].

Most did not have annual medical checkups. When they became sick they usually used self medication. They did not have problems with health service facilities and access to care, because of the government's 30 baht scheme. Most had health behavior risk of smoking, alcohol consumption, energetic drink and no exercise. The study detected physical symptoms such as headache, skin rash and low back pain [11]. Socially, they had good relationships with their neighbors, participated in political elections, and were involved with activities of community and were satisfied with family and social situation. These observations are partially consistent with those of a study in a large waste site

in Poland, which reported that potential health effects of waste site-related environmental exposures might include psychological problems, digestive tract disorders and respiratory disorders as well as allergic symptoms [7].

CONCLUSION

It appears that the scavengers in this study may well be facing health risk due to exposure to solid waste and related factors. Risky behavior for self protection during work, suboptimal personal hygiene, smoking, drinking and taking food and water in the workplace lead to increasing danger to health. These observations suggest that further action should be taken to reduce adverse exposures during waste collection. Dump site scavenging should be incorporated into the formal sector program for reducing health hazards to workers.

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