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Differences in injury and trauma management between migrant workers and citizens

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Abstract

In Taiwan, legal migrant workers and almost all citizens are covered under the National Health Insurance program. Work-related injuries and various traumatic events constitute 2 major reasons for seeking medical care among migrant workers. Therefore, we conducted this retrospective study to delineate the clinical features of migrant workers with trauma and determine differences in trauma management between migrant workers and citizens under the current medical care and insurance system.

We retrospectively reviewed the data of all patients with trauma who were discharged from adult wards between January 1, 2015 and December 31, 2016. We identified 5854 citizens and 110 migrant workers during the chart review. Data related to the prehospital period, emergency department, hospital course, and prognosis were collected and compared between migrant workers and citizens.

More than half of the traumatic events among migrant workers occurred at factory, farm, or mine locations (migrant workers vs all citizens: 57.3% vs 11.5%), whereas most traumatic events among citizens occurred at street and home or dormitory locations (street: migrant workers vs all citizens: 17.3% vs 52.5%; home or dormitory: migrant workers vs all citizens: 0.9% vs 14.3%). Compared with citizens, migrant workers had lower scores in injury severity scores and new injury severity scores, but higher scores in revised trauma score and trauma and injury severity scores. The hospital course and prognosis were similar between migrant workers and citizens.

Compared with citizens, migrant workers had a higher incidence of work-related injury and sustained less severe injuries. Under the coverage of the current health care and insurance system in Taiwan, migrant workers with trauma and work-related injuries receive comparable medical care and prognoses to citizens.

Abbreviation: ED = emergency department.

Keywords: migrant worker, medical care, insurance system, work-related injury, trauma, prognosis

1. Introduction

In the era of globalization, people work in foreign countries because of higher wages, more chances of employment, and better opportunities of career development relative to their home countries. Migrant workers, particularly illegal workers, often work under limited social protection and barely gain access to health services.[1–3] High medical insurance fees, inadequate safety regulations in the workplace, and ineffective enforcement on legislation are the major reasons for migrant workers' vulnerability to health problems.[1,3,4] In addition, many migrant workers are employed as unskilled workers, who are often engaged in 3-D ("dirty, dangerous, and demanding") jobs.[4,5] Language and cultural barriers, insufficient safety training, and relatively long working hours further increase the risk of work-related injuries among migrant workers.[4–6]

The Taiwan government has imported foreign workers from Southeast Asia since 1989 because of labor shortage.[4,7] The number of migrant workers rose to 551,596 in 2014 and accounted for 4.8% of the total labor force in Taiwan.[4] The National Health Insurance program has been implemented in Taiwan since 1995, and all citizens and legal migrant workers are covered under this program.[4,7,8] Taiwan is an island and is separated from other countries by wide oceans, and this thus impedes the inflow of illegal migrants. Most illegal migrant workers in Taiwan are "missing workers" who abscond from their employers. Missing workers accounted for <5% of all migrant workers.[4] In Taiwan, most migrant workers have the same health insurance coverage as citizens. This thus constituted an excellent opportunity for us to verify the efficiency of medical care provided by the National Health Insurance to migrant workers. Work-related injuries and various traumatic events

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The datasets generated during and/or analyzed during the present study are available from the corresponding author on reasonable request.

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constitute 2 major reasons for seeking medical care among migrant workers.[9] Therefore, we conducted this retrospective study to delineate the clinical features of migrant workers with trauma and to determine differences between medical care provided to migrant workers and that provided to citizens in Taiwan.

2. Methods

This study was reviewed and approved by the Institutional Review Board of Human Research, Chi-Mei Medical Center. We retrospectively reviewed the data of all patients with trauma discharged from adult wards between January 1, 2015 and December 31, 2016. Migrant workers were identified by their unique identification numbers on the chart.

We collected patients' data regarding demographics (age, sex, and comorbidities), prehospital presentations (locations of injury, mechanisms of injury, and time and transportation from injury sites to the hospital), emergency department (ED) presentations (vital signs, triage, Glasgow Coma Scale, emergent interventions in the ED, time from the ED to the ward, and time from the ED to the operating room), hospital course (requirements for surgery, requirements for intensive care, hospital length of stay, and length of stay in the intensive care unit), and prognosis (complications, mortality, and requirements for chronic care).

We identified 5854 citizens and 110 migrant workers during the chart review. Four foreign tourists were excluded. Because the age of migrant workers ranged from 18 to 50 years, we created a subgroup of citizens aged 18 to 50 years (2376 patients) from all citizens to minimize the bias resulting from the difference in age. Accordingly, we analyzed 3 study cohorts: migrant workers, citizens aged 18 to 50 years, and all citizens. Collected variables were compared between migrant workers and the other 2 groups. In order to analyze the differences on work-related injuries between migrant workers and citizens. We separated 724 patients with work-related injuries and divided them into 3 groups: 63 patients in the group of migrant workers, 382 patients in the group of citizens aged 18 to 50 years, and 661 patients in the group of all citizens.

Statistical analyses were performed using SPSS 15 (SPSS, Inc, Chicago, IL). We employed the chi-square test and Student's *t* test to evaluate differences in categorical and continuous variables, respectively, between different groups. Continuous data are presented as the mean ± standard deviation. Because the times from injury to the ED, from the ED to the ward, and from the ED to the operation room showed more outliers, these data were compared using the Mann–Whitney *U* test between groups and are presented as the median and interquartile range. In all cases, a *P* value of $<.05$ was used as the threshold for statistical significance.

3. Results

3.1. Incidence

According to statistics presented by the Labor Affairs Bureau of Tainan City Government in 2015, a total of 1,885,541 citizens lived in Tainan, of whom 948,000 were laborers. In the same year a total of 52,479 migrant workers worked in Tainan.[10] During the 2-year study period, the estimated trauma-related admission rates among citizens and migrant workers were 3.1 and 2.1 per 1000 persons, respectively. Furthermore, when only work-related trauma admission among laborers was considered, the estimated incidence was 0.7 per 1000 laborers among citizens and 1.2 per 1000 laborers among migrant workers.

3.2. All patients with trauma

Table 1 lists the details of ED vital signs, severity, management, hospital courses, and prognosis of all patients with trauma in the 3 groups. Compared with all citizens and citizens aged 18 to 50 years, migrant workers were younger, showed male predominance, and had lower comorbidities (migrant workers vs all citizens: 28.5 ± 7.2 vs 49.2 ± 22.3, $P=.000$; 87.3% vs 57.3%, $P=.000$; 5.5% vs 38.3%, $P=.000$; migrant workers vs citizens aged 18–50 years: 28.5 ± 7.2 vs 34.0 ± 9.9, $P=.000$; 87.3% vs 67.9%, $P=.000$; 5.5% vs 15.8%, $P=.003$). In the ED, all citizens showed higher systolic arterial pressure levels than did migrant workers. Migrant workers demonstrated lower triage severity levels than did citizens aged 18 to 50 years and all citizens. The Glasgow Coma Scale scores in the ED were similar between the groups. In addition, compared with the other 2 groups, the group of migrant workers showed lower scores in injury severity scores and new injury severity scores, but higher scores in revised trauma score and trauma and injury severity scores.

Regarding locations of injury occurrence, more than half of the traumatic events in the group of migrant workers occurred at factory, farm, or mine locations (migrant workers vs citizens aged 18–50 years vs all citizens: 57.3% vs 16.5% vs 11.5%), whereas most traumatic events in the group of citizens aged 18–50 years and the group of all citizens occurred at street and home or dormitory locations (street: migrant workers vs citizens aged 18–50 years vs all citizens: 17.3% vs 61.6% vs 52.5%; home or dormitory: migrant workers vs citizens aged 18–50 years vs all citizens: 0.9% vs 5.8% vs 14.3%; Fig. 1). Regarding the mechanisms of injury, crushing and penetrating injuries were common in the group of migrant workers (crushing injury: migrant workers vs citizens aged 18–50 years vs all citizens: 41.8% vs 10.0% vs 6.5%; penetrating injury: migrant workers vs citizens aged 18–50 years vs all citizens: 14.5% vs 5.6% vs 3.8%), whereas traffic accidents and falls were common causes of injury in the group of citizens aged 18 to 50 years and in the group of all citizens (traffic accidents: migrant workers vs citizens aged 18–50 years vs all citizens: 15.5% vs 59.1% vs 49.7%; falls: migrant workers vs citizens aged 18–50 years vs all citizens: 12.7% vs 17.3% vs 32.6%; Fig. 2).

Compared with citizens, a higher number of migrant workers visited the ED by themselves or with the help of friends or colleagues; however, for citizens aged 18 to 50 years and all citizens, emergency medical services constituted more than half of the medical transportation services. Migrant workers had the longest time from injury to ED and the shortest time from ED to ward. The times from the ED to surgery were similar between the groups. Most admitted patients with trauma required surgical treatment, and requirements for surgery did not differ significantly between the group of migrant workers and the other 2 groups (migrant workers vs citizens aged 18–50 years vs all citizens: 76.4% vs 73.4% vs 69.3%, $P=.007$). Regarding differences in hospital courses and prognosis between the groups, a lower proportion of migrant workers required intensive care (migrant workers vs all citizens: 7.3% vs 18.3%, $P=.003$; migrant workers vs citizens aged 18–50 years: 7.3% vs 17.3%, $P=.007$). The lengths of hospital and ICU stays, complication

Table 1

Collected data on demographics, pre-hospital period, emergency department period, hospital course, and prognosis of all patients with trauma.

	Migrant workers	Citizens 18–50 years	*P*	All citizens	*P*
Age	28.5 ± 7.2	33.5 ± 9.9	.000	49.2 ± 22.3	**.000**
Sex (male)	87.3%	67.9%	.000	57.3%	**.000**
Comorbidity	5.5%	15.8%	.003	38.3%	**.000**
ED vital signs					
SAP	139.1 ± 23.7	135.9 ± 27.9	.143	145.7 ± 33.0	**.000**
HR	84.6 ± 17.6	88.0 ± 18.2	.058	87.1 ± 25.3	.179
RR	17.4 ± 2.1	17.2 ± 2.4	.950	17.4 ± 2.9	.583
Severity					
RTS	7.770 ± 0.330	7.647 ± 0.762	**.001**	7.654 ± 0.747	**.001**
ISS	5.3 ± 5.7	9.8 ± 9.4	**.000**	9.8 ± 8.8	**.000**
NISS j	6.5 ± 7.1	11.8 ± 10.8	**.000**	11.8 ± 10.6	**.000**
TRISS	0.993 ± 0.001	0.974 ± 0.108	**.001**	0.954 ± 0.128	**.000**
GCS jj 15	91.8%	85.6%	.104	85.8%	.110
GCS 9-14	7.3%	9.5%		9.5%	
GCS 3-8	0.9%	4.9%		4.7%	
Triage 1	2.7%	8.8%	**.002**	8.0%	**.000**
Triage 2	62.7%	46.3%		44.4%	
Triage 3	33.6%	44.5%		47.4%	
Triage 4	0.9%	0.3%		0.2%	
Managements					
Transport by EMS	41.8%	54.0%	**.001**	51.1%	**.013**
Transport by themselves	41.8%	26.1%		28.9%	
Transfer from other hospital	16.4%	19.9%		20.0%	
Time from injury to ED (median, IQR)	54.0 (28.0–111.5)	41.0 (26.0–121.8)	**.048**	43.0 (26.0–141.0)	**.019**
Time from ED to ward (median, IQR)	108.0 (47.5–373.0)	138.0 (63.0–478.0)	.099	140.0 (66.8–534.0)	**.047**
Time from ED to surgery (median, IQR)	252.0 (156.0–684.5)	321.5 (181.0–652.8)	.904	319.5 (184.0–656.0)	.543
Surgery 0	23.6%	26.6%	.789	30.7%	.216
Surgery 1	67.3%	64.9%		67.7%	
Surgery > 1	9.1%	8.5%		6.7%	
Hospital course and outcome					
Hospital stay	7.0 ± 6.9	8.5 ± 12.6	.256	8.8 ± 11.9	.136
Requirement for ICU	7.3%	17.0%	**.007**	18.3%	**.003**
ICU stay	4.1 ± 2.1	7.2 ± 7.5	.087	7.2 ± 8.1	.090
Complications	0.0%	0.8%	.442	1.2%	.643
Died	0.0%	1.6%	.529	2.8%	.357
Recovery	70.9%	72.5%		69.4%	
Chronic care	28.2%	24.9%		26.8%	
Acute transfer	0.9%	1.1%		1.0%	

EMS = emergency medical service, HR = heart rate, ICU = intensive care unit, ISS = injury severity score, NISS = new injury severity score, GCS = Glasgow coma scale, RR = respiratory rate, RTS = revised trauma score, SAP = systolic arterial pressure, TRISS = trauma injury severity score.

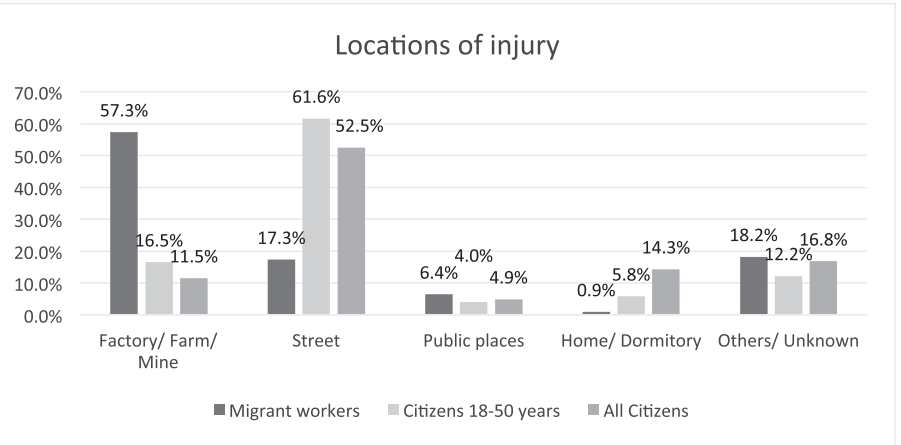

Figure 1. More than half of the migrant workers were injured at the workplace (factory/farm/mine), whereas citizens aged 18 to 50 years and all citizens were commonly injured at street and home or dormitory locations.

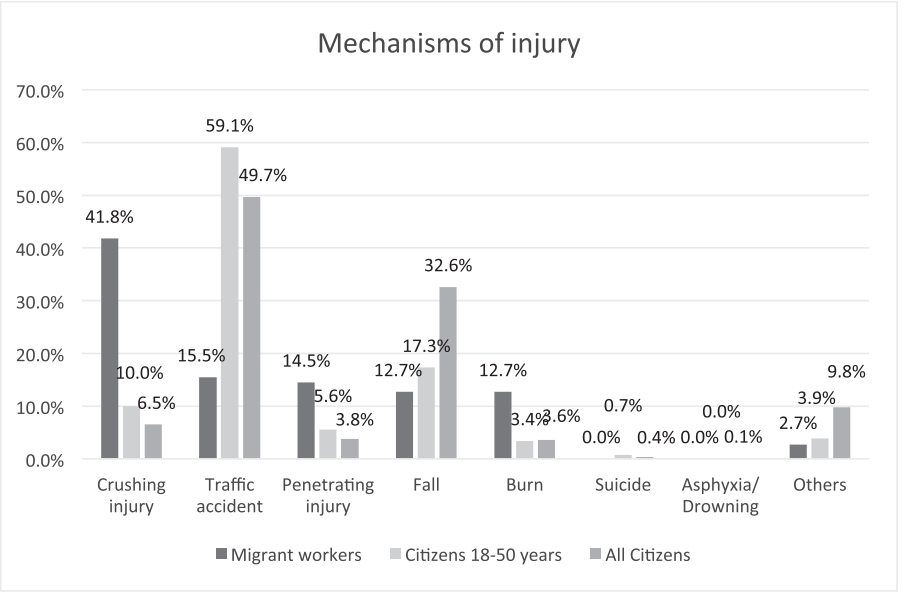

Figure 2. Crushing and penetrating injuries were common among migrant workers, whereas traffic accidents and falls were common causes of injury among citizens aged 18 to 50 years and all citizens.

rates, requirements for chronic care, and mortality were similar between the 3 groups.

3.3. Work-related injuries

Table 2 lists details of the ED vital signs, severity, management, hospital courses, and prognosis of patients with work-related injuries in the 3 groups. Compared with all citizens and citizens aged 18 to 50 years, migrant workers were younger, had fewer comorbidities, and had lower systolic arterial pressure levels. In addition, migrant workers demonstrated lower triage severity levels, ISSs, and NISSs than did citizens aged 18 to 50 years and all citizens. All 3 groups showed similar results in terms of time and transportation from injury sites to the hospital, time from the ED to surgery, and requirements for surgery. However, migrant workers had the shortest time from the ED to the ward.

None of the migrant workers required intensive care. No statistically significant differences in the length of hospital stay, complication rates, requirements for chronic care, or mortality were observed between the 3 groups.

4. Discussion

In Tainan, migrant workers had a lower incidence of trauma-related admission than did citizens. This finding can be explained by the following 2 reasons: We believe that financial and social barriers limit the daily activities of migrant workers. They often live in dormitories or rooms near work sites and seldom visit areas other than their work sites.[7] Therefore, the chance of traffic accident–related trauma is relatively low. Furthermore, ground-level falls constitute a major cause of home accidents and commonly occur among geriatric citizens.[11] Migrant workers are healthy and thus seldom hurt themselves in a ground-level fall.

The incidence of work-related injuries was higher in migrant workers than in local laborers. We believe that 3-D jobs involve a hazardous environment, posing a risk to workers. In addition, language and cultural barriers play a role in the increase in work-related injuries. However, the severity of trauma was lower in migrant workers than in citizens because work-related injuries result in less severe traumatic injuries compared with traffic accidents and geriatric fall.[12,13] We believed that is the reason that none of the migrant workers required intensive care. Moreover, work-related injuries seldom result in life-threatening conditions. In fact, even when the comparison was limited to the severity of work-related injuries, local laborers sustained more severe injuries than did migrant workers.

The medical care system in Taiwan offers similar care to both citizens and migrant workers; the only difference is in the hospital course, with migrant workers requiring lower intensive care, which can be explained by lower trauma severity levels in migrant workers. Under the current medical care and insurance system, all legal migrant workers are covered by the National Health Insurance program. We believe that this is a positive experience in terms of the health care of migrant workers. Migrant workers are usually poor and lack the social support received in their countries, rendering them vulnerable to health problems. If all migrant workers can be covered in an effective health insurance system, the care of trauma and work-related injuries can improve substantially.

As observed in this study, most migrant workers visited the ED by themselves or with the help of friends or colleagues, and this is in line with the findings of previous studies concerning migrant workers in Taiwan.[14,15] In contrast, citizens of Tainan utilized more emergency medical services than did migrant workers. This difference may have contributed to the shorter time from injury sites to the ED among citizens. Educating migrant workers to use emergency medical services liberally in severe trauma cases may shorten the time from injury to the ED.

Notably, for all trauma conditions as well as work-related injuries, citizens required a longer time from the ED to the ward than did migrant workers. The best explanation for this finding is

Table 2

Collected data on demographics, pre-hospital period, emergency department period, hospital course, and prognosis of all patients with work-related injuries.

	Migrant workers	Citizens 18–50 years	*P*	All citizens	*P*
Age	28.4 ± 7.8	36.5 ± 8.8	.054	46.5 ± 14.6	**.000**
Sex (male)	92.1%	89.8%	.060	82.9%	.575
Comorbidity	6.3%	15.2%	**.000**	24.2%	**.000**
ED vital signs					
SAP	144.9 ± 21.7	142.5 ± 27.0	.129	145.8 ± 30.7	**.014**
HR	79.6 ± 17.1	84.2 ± 16.3	.591	82.7 ± 16.8	.682
RR	17.6 ± 1.7	17.5 ± 2.1	.287	17.4 ± 2.2	.229
Severity					
RTS	7.8408 ± 0.000	7.7794 ± 0.3047	**.001**	7.7529 ± 0.5428	**.011**
ISS	3.4 ± 2.2	5.8 ± 6.7	**.000**	6.5 ± 7.0	**.000**
NISSj	4.1 ± 3.0	7.0 ± 8.0	**.000**	7.9 ± 8.7	**.000**
TRISS	0.9959 ± 0.0013	0.9905 ± 0.0416	.116	0.9769 ± 0.0833	**.016**
GCSjj 15	100.0%	96.1%	.289	95.2%	.213
GCS 9-14	0.0%	2.4%		3.3%	
GCS 3-8	0.0%	1.6%		1.5%	
Triage 1	0.0%	4.7%	**.000**	5.7%	**.020**
Triage 2	71.4%	55.0%		52.6%	
Triage 3	28.6%	40.3%		41.5%	
Triage 4	0.0%	0.0%		0.2%	
Managements					
Transport by EMS	30.2%	28.8%	.629	31.3%	.516
Transport by themselves	55.6%	51.8%		49.2%	
Transfer from other hospital	14.3%	19.4%		19.5%	
Time from injury to ED (median, IQR)	62.0 (33.0–101.5)	68.0 (33.0–113.0)	.424	68.0 (34.0–114.0)	.409
Time from ED to ward (median, IQR)	74.0 (34.0–146.3)	97.0 (55.0–215.8)	.017	114.0 (59.0–236.0)	**.002**
Time from ED to surgery (median, IQR)	232.0 (150.0–592.0)	253.0 (162.0–490.0)	.737	270.0 (178.3–519.5)	.335
Surgery 0	12.7%	16.5%	.193	17.7%	.238
Surgery 1	74.6%	77.0%		74.9%	
Surgery > 1	12.7%	6.5%		7.4%	
Hospital course and outcome					
Hospital stay	7.7 ± 8.1	7.4 ± 11.3	.971	7.9 ± 11.9	.714
Requirement for ICU	0.0%	7.6%	**.026**	9.5%	**.012**
Complications	0.0%	0.5%	.571	1.2%	.388
Died	0.0%	1.0%	.080	1.2%	.090
Recovery	76.2%	75.7%		73.2%	
Chronic care	22.2%	23.3%		25.6%	
Acute transfer	1.6%	0.0%		0.0%	

EMS = emergency medical service, HR = heart rate, ICU = intensive care unit, ISS = injury severity score, NISS = new injury severity score, GCS = Glasgow coma scale, RR = respiratory rate, RTS = revised trauma score, SAP = systolic arterial pressure, TRISS = trauma injury severity score.

that migrant workers have limited choices of medical providers due to the lack of information. Therefore, they tend to make quick decisions. Citizens and local laborers in Tainan usually have their preferences for hospitals and doctors. Moreover, their families and friends may offer suggestions. Thus, they would take more time to consider different choices. The delay in time from the ED to ward demonstrated a trend of longer waiting time from the ED to surgery. However, we did not observe evidence that such a delay would negatively affect patients' prognosis.

5. Limitations

This study included admitted patients with trauma. Those who received ED care and outpatient surgical interventions were not included in this study. These patients might have influenced the incidence of trauma and work-related injuries. However, most of these patients sustained minor injuries, which seldom result in severe health problems. Second, the derived data pertain to the condition of only one hospital in one city. The estimated incidence of trauma and work-related injuries may not be accurate. However, according to the data from Ministry of Labor of Taiwan, 59% of migrant workers work in Manufacturing industry, 69% of migrant workers work in big cities.[16] We observed the majority of injured migrant workers who visited hospitals in big cities instead of hospitals in rural area. Additionally, the study hospital has the most ED visits (120,000 annually) and is one of 2 trauma centers in Tainan. We believe that the collected data can partially represent the actual situation of migrant workers with trauma and work-related injuries. Finally, we did not follow up every patient after their discharge. Outpatient treatment and rehabilitation may alter patients' prognosis. We consider that because migrant workers can receive comparable care to citizens in prehospital settings, in the ED, and in the hospital course under the current health insurance system, there is a high probability that they can receive noninferior treatment in the follow-up period because medical care in this period is provided by the same system.

6. Conclusion

Compared with citizens in Tainan, migrant workers demonstrated a lower incidence of trauma-related admission and a higher incidence of work-related injuries. Migrant workers sustained less severe injuries compared with citizens. Under the current health insurance system, migrant workers received comparable care and prognoses to citizens.

Author contributions

Yu-Chiao Tsai: contribution to the concept of the work: drafted the article.
Nan-Chun Wu: Design of this research.
Hsiu-Chen Su: Collected the data of this research.
Chien-Chin Hsu: Drafted the article and conduct art work of this manuscript.
How-Ran Guo: Data analysis.
Kuo-Tai Chen: Contribution to the design of the work: Revised the article.

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