

## A Comparative Study on Mortality Patterns among Koreans, Korean-Chinese and Chinese

In order to understand the causal mechanism of disease aggregates peculiar to place and ethnicity, mortality data of Yanji city, China (1993) were collected, examined for validity and analyzed. Age standardized, age specific mortality rates and ten leading causes of death were compared with 1993 Korean mortality statistics. Age standardized mortality rates for both sexes were highest in Korean-Chinese followed by Koreans and Chinese (the lowest). Out of ten leading causes of death (54%-70% of the total deaths), seven for male and six causes of death for female were common in all groups. Korean-Chinese females had more similar patterns to Chinese females than males did. Differences in mortality rates by causes of death among groups suggested that hypertensive diseases and respiratory tuberculosis were associated with ethnicity, homicide/injuries inflicted by others, diabetes mellitus and chronic renal disease with environment, and others with both ethnicity and environment. These results suggest that a few causes of death were attributed to either ethnicity or environment whereas most of the ten leading causes of deaths were attributed to mixed impacts of both ethnicity and environment.

**Key Words:** Mortality; Cause of death; Emigration and immigration

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## INTRODUCTION

Korean's migration to northeast China, adjacent to the Korean Peninsula across the Yalu and Dooman rivers, has a long history. This region of China, which used to be called "Manchuria" by Japanese, once had been the main territory of Kokuryea from BC 1 till the year 668 when it fell to the allied army of Tang (a kingdom of China) and Shilla (a southern kingdom of the Korean Peninsula) (1). The current name of the nation "Korea" originated from Kokuryea. Even though most Kokuryeans remaining in the territory after the fall of their nation adapted themselves to the new regime and blended in with the Chinese, there are still a few aggregates of Kokuryean's descendants living in villages called Kokuryean villages. From 1618 to 1637, the Qing Dynasty took more than ten thousand Korean people as war trophies and only about two thousand descendants of these war prisoners are currently living with a Korean identity in the vicinity of Beijing, China. A recent massive migration to northeast China took place after the 19th century; voluntary migration of over 150,000 people from 1867 to 1904 took place in search of better living, political migration (refu-

gees) of about 260,000 people from the 1910s to the middle of the 1920s for freedom against Japanese occupation took place, and forced migration of several million people by Japanese colonialization also happened (2). Most of these forced immigrants returned to Korea after World War II and since then no massive immigration occurred. According to fourth population census of China in 1990, the Korean-Chinese population was at 1.92 million, comprising 0.17% of the total Chinese population, and about 97% of them were residing in northeast China (3).

Although over one hundred years passed since Koreans started to immigrate, studies on Korean immigrants in China are very scarce owing to the political situation that shut mutual communication till late the 1980s.

The objective of this study is to find the difference in mortality and disease patterns among Koreans, Korean-Chinese and Chinese, and to identify risk factors associated with ethnicity and environment by examining mortality data along with morbidity and dietary surveys and medical examination on rural residents of the three populations. We began the study from 1995 and will be completed by 1998. This paper presents results of the mortality study.

## MATERIALS AND METHODS

### Populations studied

For comparison, we selected Yanji City within the Korean-Chinese autonomous region of Jilin province in northeast China where Korean Chinese are residing collectively. The location was chosen because collaborative study may be easier than in other places. In this Korean-Chinese autonomous region (Yanbian 1990) 39.5% of total Korean-Chinese were still living (3). According to the 1993 population statistics the population of Yanji City was 322,358, comprising 59.5% Korean-Chinese, 38.6% Chinese (Han) and 1.9% other race including the Man tribe which ruled China as the Qing Dynasty, the last empire before the 1911 revolution (4). For the health survey following this mortality study, we selected a few satellite rural villages of the city. Korean mortality data of the whole population was utilized for the comparison because the Korean-Chinese we studied were descendants of Korean migrants from all over the Korean Peninsula although health survey was carried out on rural village people similar to Chinese study subjects. The mortality data we analyzed were deaths that occurred and were reported from January 1 to December 31, 1993.

### Methods

In China, offices responsible for death registry are the police and public health departments. Two copies of death certificates are issued by the person responsible in either hospital or village clinic, one copy for the police station and the other for the health department. Each certificate has two detachable sides, one for the crematorium and the other for the institute, where the certificate was issued (5). In order to be sure, the mortality data were collected from all four institutes and compiled. Thirty-two cases of infant deaths that were missing from the police department registration data were found in health department documents. Causes of death were missing or improperly recorded in police registration data in many occasions; among a total of 1,419 deaths, 50.5% of them had cause of death, 7.0% was unknown, 29.2%

was left blank and 13.3% with other mistakes. The cause of death surveyed by trained interviewers of the local health department were routine, however, 2.1% were left as unknown cause of death. After collecting all data of which 31.3% (444 cases) of deaths had occurred in hospitals, we selected 55 cases randomly and verified the validity of cause of deaths by reviewing medical records. All causes of deaths we examined showed excellent agreement with the medical records.

For Koreans we utilized annual death statistics based on vital registration (6). The validity of causes of death were remarkably improved from 1989, when the national medical insurance system in Korea was completed, providing everybody with access to medical care in qualified medical institutes, even though only 52% of all death certificates was issued by medical institutes. Still 5.9% of the total deaths (230,770), however, remained unclassifiable causes of death. For the purpose of comparison, we re-classified the causes of deaths, which were primarily classified by ninth revision of ICD code in both countries, into 124 abridged tabulation list of mortality for Korea. For comparisons on the magnitude of mortality rates between the three groups by cause of death, we had to use reporting rate adjusted mortality rates in addition to age standardized rate with pooled 1990 population censuses of Korea and China (7, 8).

## RESULTS

### Characteristics of the populations studied

The Korean-Chinese population in Yanji City consists of immigrants and their descendants who migrated to northeast China from all over the Korean Peninsula during the period from 1886 to 1945 when World War II was ended. According to the information collected during morbidity survey on the immigration generation among the population older than 50 year of age, over 80% of them were born in China. About 20% of them were first generation, 44.7% second generation, 32.6% third generation, and 2.8% fourth generation (Table 1). The proportion of each generation by age group suggests that

**Table 1.** Current status of migration generation by age group among Korean-Chinese population older than 50 years of age, 1996

Age (years)	First generation	Second generation	Third generation	Fourth generation	Total
50-59	7 (10.0)	36 (51.4)	23 (32.9)	4 (5.7)	70 (100.0)
60-69	14 (21.9)	29 (45.2)	20 (31.3)	1 (1.6)	64 (100.0)
70-79	13 (31.7)	13 (31.7)	15 (36.6)	0 (0.0)	41 (100.0)
80+	2 (33.3)	3 (50.0)	1 (16.7)	0 (0.0)	6 (100.0)
Total	36 (19.9)	81 (44.7)	59 (32.6)	5 (2.8)	181 (100.0)

( ), percent

most of the current population are family members of political migrants who migrated from the 1910s to 1920s. Most of the forced migrants, several millions of Koreans, who were forced to migrate by Japanese from the late 1920s till the end of World War II. Many seemed to have returned to Korea after the war. The Han tribe, the major ethnic group constituting 92% of the total Chinese population (8), also migrated to north-east China mainly from Hebei and Shandong provinces of China after 1869 to clear land and cultivate (9, 10).

### Mortality rates by population

#### Crude and age adjusted mortality rates by sex and population

The mortality rates for both sexes were the highest in Korean-Chinese, and lowest in Chinese (Han tribe) among the three groups compared. It appears that the deaths which occurred in Yanji City in 1993 were not reported very well when it was compared with the age adjusted mortality rates/10<sup>5</sup> population of 1990 Chinese census; 920.3 for Korean-Chinese males, 689.9 for Korean-Chinese females, 645.5 for Chinese males, and 571.2 for Chinese females (8). Table 2 shows the base population studied and mortality rates by sex and population

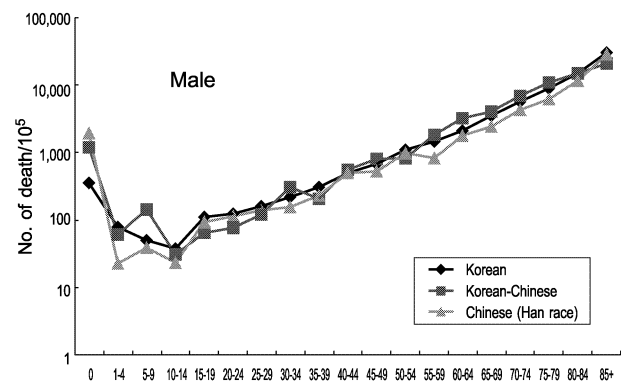


Fig. 1. Age specific mortality rate in male by population characteristics.

group.

#### Age specific mortality rates by sex and population

The age specific mortality rates show similar patterns among the male population, being the lowest rates in all ages but infants (highest) for Chinese among the three groups with more consistency than female population (Fig. 1). The patterns of female age specific rates were inconsistent except Korean females, perhaps owing to smaller number of death as shown in Fig. 2. The age and

Table 2. Base population by age and sex, crude and age adjusted mortality rates\*

Age class	Male			Female		
	Korean	Yanji City		Korean	Yanji City	
		Korean-Chinese	Chinese (Han)		Korean-Chinese	Chinese (Han)
0	334,829	1,011	624	297,573	950	600
0-4	1,413,065	6,550	4,423	1,255,990	6,429	4,025
5-9	1,727,679	7,672	5,178	1,575,684	7,538	4,720
10-14	2,127,858	6,380	4,306	1,995,021	6,031	3,776
15-19	2,072,733	7,823	5,280	1,942,949	8,253	5,167
20-24	2,332,831	10,522	7,101	2,203,872	11,595	7,259
25-29	2,089,969	11,644	7,858	2,001,850	11,834	7,409
30-34	2,216,520	10,545	7,117	2,129,698	10,507	6,578
35-39	1,899,382	9,074	6,124	1,823,339	8,820	5,522
40-44	1,360,113	5,730	3,867	1,289,897	5,465	3,422
45-49	1,153,922	4,192	2,829	1,110,865	4,499	2,816
50-54	1,081,451	4,119	2,780	1,077,102	4,320	2,705
55-59	897,177	3,368	2,273	940,475	3,661	2,292
60-64	591,047	2,401	1,620	750,951	2,796	1,750
65-69	388,551	1,590	1,073	569,408	2,012	1,260
70-74	268,588	908	613	412,321	1,243	778
75-79	142,051	479	323	272,461	869	544
80-84	60,770	166	112	153,749	420	263
85-	18,830	62	42	75,496	181	114
Total	22,177,366	94,236	63,543	21,878,701	97,423	61,000
CMR*	523.8	501.4	385.4	592.4	598.5	426.5
ASMR†	479.7	609.3	441.4	608.3	729.6	526.2

\* Crude mortality rate/10<sup>5</sup>, † Age standardized mortality rate/10<sup>5</sup>

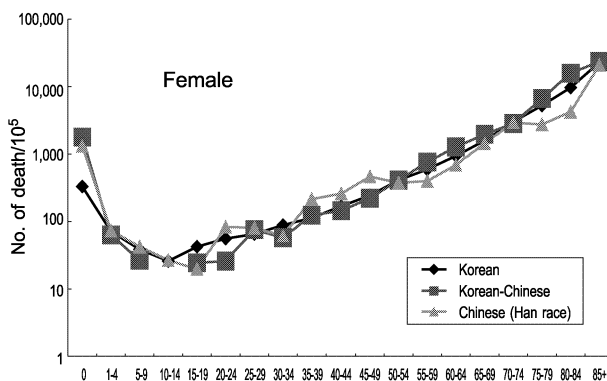


Fig. 2. Age specific mortality rate in female by population characteristics.

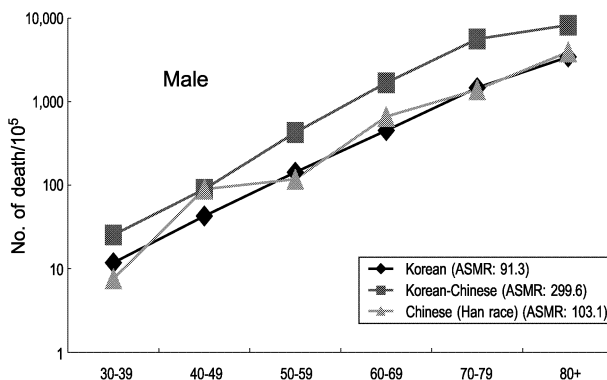


Fig. 3. Age specific mortality rate of Cerebrovascular disease in male by population characteristics. ASMR, age standardized mortality rate.

cause of specific mortality rate for cerebrovascular disease, which is the only disease frequent enough to make figure, is shown in Fig. 3 and Fig. 4. Generally, the older the age the larger the difference between Korean and Korean-Chinese in both sexes, with much higher mortality among Korean-Chinese in all ages and sexes. On the other hand, mortality rates of the cerebrovascular diseases by age and sex for Chinese showed inconsistent pattern with high rate among those in their 40s, probably due to fewer cases.

#### Ten leading causes of death

In all three groups, the ten leading causes of death consist of 54%-70% of the total deaths. Seven for males and six causes of deaths for females were commonly included in the ten leading causes of death for all three groups. Diabetes mellitus and tuberculosis of respiratory system in Korean males, homicide/injury inflicted by others in Korean-Chinese males, chronic bronchitis/asthma/emphysema and chronic rheumatic heart diseases for Chinese males were diseases that the other two popula-

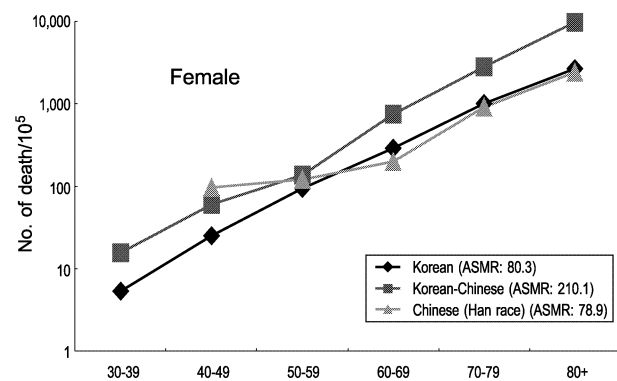


Fig. 4. Age specific mortality rate of Cerebrovascular disease in female by population characteristics. ASMR, age standardized mortality rate.

tions did not have in their ten leading causes of death. Hypertensive diseases in both Korean and Korean-Chinese males, acute/chronic pulmonary heart diseases in both Korean-Chinese and Chinese males were commonly included as shown in Table 3. Interestingly, however, Korean-Chinese females seemed to have more similar patterns to Chinese females than Korean-Chinese males to Chinese males (Table 4); motor vehicle traffic accident, diabetes mellitus and heart failure in Korean female, malignant neoplasm of lung for Chinese females were the causes of death that the other groups did not have while three causes of deaths, for example acute/chronic pulmonary heart diseases, chronic liver disease/cirrhosis and chronic renal diseases (nephritis, nephrotic syndrome & nephrosis), were common in both Korean-Chinese and Chinese females contrast to only one disease (hypertensive) was common in both Korean and Korean-Chinese females. People living in China still die from several causes that had been notorious causes of death among Koreans in the 1960s.

Magnitude of difference in mortality rate by causes of death among the three populations is shown in Table 5 and Table 6. The causes of deaths which revealed statistically significant differences ( $p < 0.05$  and  $p < 0.001$ ) in mortality rate/ $10^5$  after reporting rate adjusted by sex and population, showed different patterns. It can be assumed that the causes of death are associated with place (environment) if the mortality rate shows a difference between Korean and Korean-Chinese when there is no difference between Korean-Chinese and Chinese populations, and those are associated with ethnicity (genetic) if the mortality rate shows no difference between Korean-Chinese and Korean, when there is a difference between Korean-Chinese and Chinese and/or between Korean and Chinese. It would be more significant when it is consistent for both sexes. The causes of death that appeared to be associated with ethnicity were hypertensive disease

**Table 3.** Ten leading causes of death in male by population characteristics

Rank	Korea (1993)			Yanji City China (1993)			Chinese (Han)		
	Korean			Korean-Chinese			Chinese (Han)		
	Cause of death	ASMR*/10 <sup>5</sup>	% total	Cause of death	ASMR/10 <sup>5</sup>	% total	Cause of death	ASMR/10 <sup>5</sup>	% total
1	Cereb.Vasc.Dis (430-438)	91.3	15.0	Cereb.Vasc.Dis	299.6	41.1	Cereb.Vasc.Dis.	103.1	19.6
2	Chr.Liv.Dis.&Cirr (571)	44.4	7.3	Malig.Neop. of liver	42.8	5.9	Acu/Chr Pulm.Hrt.Dis.§	55.6	10.6
3	Mot.Veh.Traf.Acci (E810-E825)	43.6	7.2	Chr.Liv.Dis.&Cirr.	32.8	4.5	Isch. Heart Dis.	26.6	5.1
4	Malig.Neop. of Stom. (151)	39.6	6.5	Mot.Veh.Traf.Acci.	27.6	3.8	Malig.Neop. of liver	23.6	4.5
5	Malig.Neop. of liver (155)	35.1	5.7	Malig.Neop. of Stom.	26.4	3.6	Chr.Liv.Dis.&Cirr.	21.5	4.1
6	Hypert.Dis.* (401-405)	29.3	4.8	Isch. Heart Dis.	23.8	3.3	Chr.Bronch./Asth./Emphysema†	21.3	4.0
7	Malig.Neop. of lung (162)	28.4	4.7	Homic.&Inj. by Oth.† (E960-E969)	19.6	2.7	Malig.Neop. of Stom.	19.1	3.6
8	Diabetes mellitus† (250)	18.7	3.1	Hypert.Dis.*	16.1	2.2	Malig.Neop. of lung	17.9	3.4
9	Isch. Heart Dis. (410-414)	16.8	2.8	Acu/Chr Pulm.Hrt.Dis.§ (415-416)	12.0	1.6	Mot.Veh.Traf.Acci.	15.8	3.0
10	Tuberc. of Resp.Sy.† (010-012)	14.7	2.4	Malig.Neop. of lung	10.7	1.5	Chr.Rheum.H.D.† (393-398)	12.4	2.4
% of total death			59.5			70.1			60.2

\* Age standardized mortality rate/10<sup>5</sup>, † The cause of death that was included uniquely only in the group, ‡ The cause that was included commonly in Korean and Korean-Chinese, § The cause that was included commonly in Korean-Chinese and Chinese  
Number in ( ): 9th revision ICD code number

**Table 4.** Ten leading causes of death in female by population characteristics

Rank	Korea (1993)			Yanji City (1993)			Chinese (Han)		
	Korean			Korean-Chinese			Chinese (Han)		
	Cause of death	ASMR*/10 <sup>5</sup>	% total	Cause of death	ASMR/10 <sup>5</sup>	% total	Cause of death	ASMR/10 <sup>5</sup>	% total
1	Cereb.Vasc.Dis. (430-438)	80.3	20.9	Cereb.Vasc.Dis.	210.1	41.1	Cereb.Vasc.Dis.	78.9	21.4
2	Hypert.Dis.* (401-405)	26.6	6.9	Acu/Chr Pulm.Hrt.Dis.§ (415-416)	21.0	4.1	Acu/ChrPulm.Hrt. Dis.§	48.8	13.3
3	Malig.Neop. of Stom. (151)	20.0	5.2	Chr.Liv.Dis.&Cirr. (571)	19.3	3.8	Chr.Bronch./Asth./Emphy.	31.4	8.5
4	Mot.Veh.Traf.Acci.† (E810-E825)	15.5	4.0	Chr.Rheum.H.D.	18.2	3.6	Isch. Heart Dis.	16.1	4.4
5	Diabetes mellitus† (250)	14.3	3.7	Isch. Heart Dis.	17.3	3.4	Malig.Neop. of lung†	11.3	3.1
6	Chr.Bronch./Asth./Emphy. (490-493)	11.9	3.1	Hypert.Dis.*	15.2	3.0	Malig.Neop. of liver	11.0	3.0
7	Heart failure† (428)	10.9	2.8	Malig.Neop. of liver	15.1	3.0	Chr.Rheum.H.D.	7.2	2.0
8	Malig.Neop. of liver (155)	9.9	2.6	Chr.Bronch./Asth./emphy. &Emphysema	14.0	2.7	Chr.Liv.Dis.&Cirr.	6.8	1.8
9	Isch. Heart Dis. (410-414)	9.8	2.5	Malig.Neop. of Stom.	11.6	2.3	Malig.Neop. of Stom.	6.1	1.7
10	Chr.Rheum.H.D. (393-398)	9.5	2.4	Neph.Neph.Synd.&Nephrosis§ (580-589)	10.2	2.0	Neph.Neph.Synd. &Nephrosis§	4.7	1.3
% of total death			54.1			68.8			60.4

Footnotes are the same as Table 3.

**Table 5.** Age and reporting rate adjusted mortality rate/105 of cause of death and its ratio by sex and population characteristics

Cause of death	Male			Female		
	Korean	Korean-Chinese	Chinese	Korean	Korean-Chinese	Chinese
Cerebrovascular disease (430-438)	91.3 (1.0)*	374.5 (4.1)	133.9 (1.5)	80.3 (1.0)*	276.4 (2.7)	121.4 (1.5)
Chronic Liver diseases and cirrhosis (571)	44.4 (1.6)	41.0 (1.5)	27.9 (1.0)*	9.5 (1.0)*	25.4 (2.7)	10.5 (1.1)
Motor vehicle traffic accidents (E810-E825)	43.6 (2.1)	34.5 (1.7)	20.5 (1.0)*	15.5 (2.7)	8.2 (1.4)	5.8 (1.0)*
Malignant neoplasm of the Stomach (151)	39.6 (1.6)	33.0 (1.3)	24.8 (1.0)*	20.2 (2.1)	15.3 (1.6)	9.4 (1.0)*
Malignant neoplasm of the Liver (155)	35.1 (1.1)	53.5 (1.7)	30.6 (1.0)*	9.9 (1.0)*	19.9 (2.0)	16.9 (1.7)
Hypertensive diseases (401-405)	29.3 (3.8)	20.1 (2.6)	7.8 (1.0)*	26.6 (6.6)	20.0 (5.0)	4.0 (1.0)*
Malignant neoplasm of the lung (162)	28.4 (2.1)	13.4 (1.0)*	23.2 (1.7)	8.1 (2.9)	2.8 (1.0)*	17.4 (6.2)
Diabetes mellitus (250)	18.7 (1.5)	12.1 (1.0)*	12.9 (1.1)	14.3 (8.4)	1.7 (1.0)*	3.1 (1.8)
Ischemic heart diseases (410-414)	16.8 (1.0)*	29.8 (1.8)	34.5 (2.1)	9.8 (1.0)*	22.7 (2.3)	24.8 (2.5)
Chr.bronch./emphyema/asthma (490-493)	15.3 (1.0)*	18.1 (1.2)	27.7 (1.8)	11.9 (1.0)*	14.0 (1.2)	31.4 (2.6)
Tuberculosis of respiratory system (010-012)	14.7 (4.9)	11.9 (4.0)	3.0 (1.0)*	-	-	-
Homicide & injury inflicted by others (E960-E969)	2.1 (1.0)*	24.5 (11.7)	11.9 (5.7)	-	-	-
Acute/chr. pulm. heart disease (415-416)	0.4 (1.0)*	15.0 (37.5)	72.2 (180.5)	0.3 (1.0)*	21.0 (70.0)	48.8 (162.7)
Chronic rheumatic heart disease (393-398)	0.3 (1.0)*	10.5 (35.0)	16.1 (53.7)	0.4 (1.0)*	23.9 (59.7)	11.1 (27.8)
Nephritis/nephrotic synd./nephrosis (chronic renal diseases) (580-589)	-	-	-	3.3 (1.0)*	13.4 (4.1)	7.2 (2.2)

\* The lowest mortality rate among three groups and denominator for ratio

- : The numbers of death are too small to compute rate

**Table 6.** Difference of mortality rates between two groups by cause of death and order (high to low mortality) among three groups

Cause of Death	Male	Female	Interpretation
Cerebrovascular disease (430-438)	② >> ③ ≥ ① << ②	② >> ③ ≥ ① << ②	Mixed
Chronic Liver diseases and cirrhosis (571)	① ≥ ② > ③ < ①	② > ③ ≥ ① < ②	Inconsistent
Motor vehicle traffic accidents (E810-E825)	① ≥ ② > ③ << ①	① >> ② ≥ ③ << ①	Mixed
Malignant neoplasm of the Stomach (151)	① ≥ ② ≥ ③ < ①	① ≥ ② ≥ ③ < ①	Mixed
Malignant neoplasm of the Liver (155)	② > ① > ③ ≤ ②	② ≥ ③ > ① << ②	Inconsistent
Hypertensive diseases (401-405)	① ≥ ② >> ③ << ①	① ≥ ② >> ③ << ①	Ethnic
Malignant neoplasm of the lung (162)	① ≥ ③ > ② < ①	③ > ① >> ② << ③	Inconsistent
Diabetes mellitus (250)	① ≥ ③ ≥ ② ≤ ①	① > ③ ≥ ② << ①	Environmental
Ischemic heart diseases (410-414)	③ ≥ ② > ① < ③	③ > ② > ① < ③	Mixed
Chr.bronch./emphyema/asthma (490-493)	③ ≥ ② ≥ ① < ③	③ > ② ≥ ① < ③	Mixed
Tuberculosis of respiratory system (010-012)	① ≥ ② >> ③ << ①	-	Ethnic
Homicide & injury by others (E960-E969)	② > ③ > ① << ②	-	Environmental
Acute/chr. pulm. heart disease (415-416)	③ >> ② >> ① << ③	③ >> ② >> ① << ③	Mixed
Chronic rheumatic heart disease (393-398)	③ ≥ ② >> ① << ③	② > ③ >> ① << ②	Inconsistent
Nephritis/nephrotic synd./nephrosis (580-589)	-	② ≥ ③ ≥ ① << ②	Environmental

①, Korean; ②, Korean-Chinese; ③, Chinese

&gt;, 0.05&gt;P&gt;0.001; &gt;&gt;, P&lt;0.001; ≥ or ≤, no significant difference

Mixed, mixed impact of both ethnicity and environment to disease causation; Ethnic, impact of ethnicity; Environmental, impact of environment; Inconsistent, Inconsistency of order and strength of association between sex

and respiratory tuberculosis, which have a higher mortality among Koreans than Chinese while diabetes mellitus and chronic renal diseases among females and homicide/injuries by others among males seemed to be associated with the environment. Other causes of death showed patterns of mixed impact by both ethnicity and environment or inconsistency. The pattern suggested, however, that chronic lung diseases including chronic obstructive lung diseases and acute/chronic pulmonary heart diseases had a tendency of stronger association with Chinese and stomach cancer with Korean ethnicity while cerebrovascular diseases, liver cancer and chronic rheumatic heart disease showed a stronger association with the environment.

## DISCUSSION

Migrant studies may provide valuable information in understanding the causal mechanism of disease aggregates peculiar to place and ethnicity (11, 12). The objective of this mortality study was to examine the difference of disease pattern among three population groups as a preliminary step to the study of Korean migrants in China. The study includes household interview survey on morbidity and dietary intake, and health examination with several clinico-pathologic tests such as hematocrit, serum lipid profile, urine sodium, FBS/PP2, markers of hepatitis B virus infection, blood pressure, body mass index, and ECG.

Age standardized mortality rate, even after reporting rate adjusted, was highest in Korean-Chinese followed by Korean and Chinese. The age specific mortality rate, however, showed a somewhat peculiar pattern in the Chinese population, the smallest group, with the highest male infant mortality rate and inconsistent pattern in females among others. Infant mortality rates were higher in the Chinese and the Chinese-Korean groups which might be associated with low accessibility to quality medical care. Infant mortality rate/1000 live birth and maternal mortality rate/10<sup>5</sup> live birth were reported to be 43.6 and 67.3 for China (1993) (13) while they were 9.6 and 13.7 respectively for Korea, where utilization rate of prenatal clinic was 95% and hospital delivery 99% in 1991 (14).

Ten leading causes of death comprised 54%-70% of the total deaths. Taking validity and preference in tabulating cause of death between the two countries into account, medical records randomly selected were examined prior to the comparison. Validity of diagnosis appeared to be adequate although there was a tendency of diagnosis preference for ischemic heart diseases and pulmonary heart diseases in China and for hypertensive

diseases in Korea. Many of ischemic heart diseases were clinically diagnosed as the cause of death without objective data base when we examined medical records. Seven or six causes of death out of ten were common among all three groups. Diabetes mellitus and respiratory tuberculosis in Korean males, homicide/injuries inflicted by others in Korean-Chinese males, and chronic rheumatic heart diseases and chronic bronchitis/emphysema/asthma in Chinese males appear to be important causes of death peculiar to each population. Motor vehicle accident, diabetes mellitus and heart failure in Korean females and lung cancer in Chinese females belong to the same category.

Korean-Chinese females, on the other hand, had more similar causes of death to Chinese females than to Korean females, a ratio of 3:1 common cause of death suggesting that females are prone to acculturation as shown in similar studies (15-18). Male Korean immigrants had similar mortality pattern to Korean males, presumably they are in a better situation as head of the family to preserve Korean traditional culture, family system, and life style.

The magnitude of mortality rate difference among the three groups by the cause of death and sex revealed similar patterns to simple comparison of ten leading causes of death but with more information on inter-group relationship, enabling crude differentiation of disease causality related to either ethnicity or environment. Even though there are a few causes of death with inconsistent patterns between sex, some of them showed consistent direction of relationships; such as ethnic impact like hypertensive diseases and respiratory tuberculosis and environmental impacts like homicide/injuries inflicted by others, chronic renal diseases and diabetes mellitus.

Most of the causes of death showed a pattern of mixed impact although some showed a stronger impact of ethnicity and the others showed a stronger environmental influence. This mixed result was perhaps attributed to the transient process of acculturation, or actually the ethnicity and the environment being common risk factors operated together on the disease causation. The highest mortality from homicide/injuries inflicted by others among males and from cerebrovascular diseases among both sexes of Korean-Chinese seemed to reflect immigration-related hardship living under tremendous stress along with ethnic peculiarity; hypertension prone race, hasty and hot-tempered personality contrary to relaxed, slow-responsive personality of Chinese (16). The highest mortality of Koreans from motor vehicle accident might be also related to this temperament beside the environmental factor such as high proportion of owner driving in congested roads (19).

Among Chinese, chronic pulmonary diseases appeared

to be associated with ethnicity and environment; higher rates of smoking among Chinese women (30% compared to 5% for Korean-Chinese and 6% for Korean), cold weather, and fry cooking in closed space (17, 20).

Chronic rheumatic heart diseases and chronic renal diseases have been important causes of deaths among Koreans before the 1960s, mostly owing to poor living standard (GNP per capita under \$100 versus near \$10,000 now), whereas mortality from diabetes mellitus has been steadily increasing recently, 4-5 times in several years (19), which may indicate stronger environmental (dietary) factors than ethnicity.

Chronic liver diseases including chronic hepatitis, cirrhosis and neoplasm which showed particularly high mortality among Koreans in Korea, China and Japan seemed to be attributed to heavy alcohol consumption and high infection rate of hepatitis viruses (21-23).

Risk factors related to causes of death discussed above may become clearer when additional morbidity survey data, namely information on smoking and drinking habits, dietary intake pattern, serum lipid profile, FBS & PP2, serologic markers of HBV, BP, BMI, and ECG become available.

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