HYGIENIC STUDIES OF FARMING VILLAGES IN TOCHIGI PREFECTURE III

REPORT 2. GROUP MEDICAL EXAMINATION OF MOTEGI TOWN ON THE BLOOD PRESSURE, ECG FINDINGS AND THE RESULTS OF URINE EXAMINATION

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The previous report treated of the cephalic and facial findings, physique, bodily type, percussive and auscultatory findings and cutaneous findings of the inhabitants living in the Shimogo and Kamisugamata Sections of Motegi Town. This report treats of the blood pressure, ECG findings and the results of urine examination.

I TIME AND SUBJECT OF INVESTIGATION

As in the previous report¹⁾, we made the same investigation of the 53 persons in the Shimogo Section on the 14th of September, 1976 and of the 54 persons in the Kamisugamata Section on the 16th and 17th of April, 1977 at the public hall of each section. The number of persons by age-group, that of examinees and the rate of examination are shown in Table 1.

Table 1 Persons by Age-group, Examinees and Rate of Examination in Shimogo and Kamisugamata Sections

Section		Shimogo			Kamisugamata (containing part of Shimogo Section)		
Age-Group	Sex	Population (s. 51)	Examinees (s. 51.9)	Rate of Examination	Population (s. 52)	Examinees (s. 52.4)	Rate of Examination
70 ~	Male	6	4	66.7	7	4	57.1
	Female	6	4	66.7	8	3	37.5
60 ~	Male	7	2	28.6	9	5	55.6
	Female	9	9	100.0	11	16	100.0
50 ~	Male	9	9	100.0	9	5	55.6
	Female	9	9	100.0	11	14	100.0
40 ~	Male	10	5	50.0	16	4	25.0
	Female	10	5	50.0	11	3	27.3
30 ~	Male	7	3	42.9	4	0	0.0
	Female	5	1	20.0	9	0	0.0
20 ~	Male	10	1	10.0	8	0	0.0
	Female	10	1	10.0	11	0	0.0
10 ~	Male	3	0	0.0	15	0	0.0
	Female	5	0	0.0	17	0	0.0
0 ~	Male	7	0	0.0	11	0	0.0
	Female	12	0	0.0	7	0	0.0
Total	Male	60	24	40.0	79	18	22.8
	Female	67	29	43.3	85	36	42.4

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We measured blood pressure at the right upper arm by auscultatory method with a Riva-Rocci sphygmomanometer in a sitting position, adopting Swan point five as minimum blood pressure. We took electrocardiograms with a DU-3S electrocardiograph manufactured by FUKUDA DENSHI CO., LTD., and we made an examination of albuminuria and glycosuria by a Combistix manufactured by MILES-SANKYO CO., LTD. and of urobilinogen by a Urobilistix manufactured by the same company.

II RESULTS

1 Blood pressure

As is shown in Fig. 1, the maximum blood pressure of both the males and females in the Shimogo Section is about 130–139 mmHg, of whom 5 males (20.8%) and 14 females (48.3%) are above 150 mmHg, and so more females are sufferers from high blood pressure. Nevertheless, no statistically significant difference can be seen between the males and the females of over 40 years ($X^2=3.44$).

As is shown in Fig. 2, the minimum blood pressure of most males is about 80–89 mmHg, while that of most females is about 70–79 mmHg, and no statistically significant difference can be seen between the sexes. The minimum blood pressure of 6 males (25.0%) and as many females (20.7%) is above 90 mmHg.

As is shown in Table 2, the average and the standard deviation of maximum and minimum blood pressure of 20 males of over 40 years are 137.3 ± 18.7 mmHg and 83 ± 11.6 mmHg respectively and those of 27 females of over 40 years are 151.4 ± 28.0 mmHg and 79.9 ± 12.8 mmHg. No statistically significant difference can be seen between the sections and sexes.

As is shown in Fig. 3, the maximum blood pressure of the males and females in the Kamisugamata Section is mostly about 130–139 mmHg and about 140–149 mmHg respectively.

The maximum blood pressure of 5 males (27.8%) and 10 females (28.6%) is above 150 mmHg, which is about the same rate, and no statistically significant difference can be seen between the sexes.

As is shown in Fig. 4, the minimum blood pressure of the males and females in the section is mostly about 80–89 mmHg. The minimum blood pressure of 4 males (22.2%) and 8 females (22.9%) is above 90 mmHg, which is about the same rate, and no statistically significant difference can be seen between the sexes.

As is shown in Table 2, the average and the standard deviation of maximum and minimum blood pressure of 18 males of over 40 years are 137.1 ± 21.2 mmHg and 81.4 ± 9.9 mmHg respectively and those of 35 females of over 40 years are 140.7 ± 18.1 mmHg and 81.1 ± 11.3 mmHg. And no statistically significant difference can be seen between the sexes and sections.

Table 2 The Average Value of Blood Pressure of the persons of over 40 years in both Sections

	Sex	Number of Persons	Shimogo (mmHg)	Number of Persons	Kamisugamata (mmHg)
Maximum	Male	20	137.3 ± 18.7	18	137.1 ± 21.2
	Female	27	151.4 ± 28.0	35	140.7 ± 18.1
Minimum	Male	20	83.0 ± 11.6	18	81.4 ± 9.9
	Female	27	79.9 ± 12.8	35	81.1 ± 11.3

Fig. 1 Maximum Blood Pressure in Shimogo Section (September, 1976)

Fig. 2 Minimum Blood Pressure in Shimogo Section (September, 1976)

Fig. 3 Maximum Blood Pressure in Shimogo Section (April, 1977)

Fig. 4 Minimum Blood Pressure in Kamisugamata Section (April, 1977)

Fig. 5 ECG Findings

Of the persons of over 40 years in both sections, 51.9% of the females in the former section and 28.6% of the females in the latter section have the maximum blood pressure of over 150 mmHg, and this difference is statistically significant at the level of 5.0% ($X^2=3.84$), while the difference of the males in both sections is statistically insignificant.

As to the average blood pressure of the persons of over 40 years, no statistically significant difference is, after all, seen between the sections and sexes.

The Shimogo Section has more females suffering from blood pressure of higher than 150 mmHg with a statistically significant difference at the level of 5.0%.

In 1962, WHO stated that hypertension was maximum blood pressure over 160 mmHg and minimum blood pressure

over 95 mmHg, that border blood pressure was maximum from 140 mmHg to 160 mmHg and minimum from 90 mmHg to 95 mmHg and that normal blood pressure was maximum under 140 mmHg and minimum under 90 mmHg.

Recently, this classification has widely been adopted in Japan. According to this division, as is shown in Table 3, and Table 4, 2 males (8.3%) and 2 females (6.9%) in the former section, and 2 males (11.1%) and 3 females (8.6%) in the latter section are sufferers from hypertension.

Table 3 Classification of Blood Pressure by WHO
September, 1976 (Shimogo Section)

Maximum Blood Pressure					Maximum Blood Pressure				
Male		under 140 mmHg	over 140 mmHg under 160 mmHg	over 160 mmHg	Female		under 140 mmHg	over 140 mmHg under 160 mmHg	over 160 mmHg
Minimum Blood Pressure	under 90 mmHg	16 (66.7%)	2	0	Minimum Blood Pressure	under 90 mmHg	14 (48.3%)	2	7
	over 90 mmHg	1	1	0		over 90 mmHg	0	0	4
	under 90 mmHg		(4.2%)			under 95 mmHg		(0%)	
	over 95 mmHg	0	2	2 (8.3%)		over 95 mmHg	0	0	2 (6.9%)

Table 4 Classification of Blood Pressure by WHO
April, 1977 (Kamisugamata Section)

Maximum Blood Pressure					Maximum Blood Pressure				
Male		under 140 mmHg	over 140 mmHg under 160 mmHg	over 160 mmHg	Female		under 140 mmHg	over 140 mmHg under 160 mmHg	over 160 mmHg
Minimum Blood Pressure	under 90 mmHg	11 (61.1%)	2	1	Minimum Blood Pressure	under 90 mmHg	14 (40%)	12	1
	over 90 mmHg	0	1	1		over 90 mmHg	1	1	1
	under 95 mmHg		(5.6%)			under 95 mmHg		(2.9%)	
	over 95 mmHg	0	0	2 (11.1%)		over 95 mmHg	1	1	3 (8.6%)

2 ECG

As is shown in Table 5 and Fig. 5, all the examinees (24 males and 29 females) in the Shimogo Section took ECG's in September, 1976, while 16 males (88.8%), and 29 females (80.5%) in the Kamisugamata Section did in April, 1977.

The older is age, the more are ECG findings, which are seen in 8.3% of the males and 31.0% of the females in the Shimogo Section and in 31.0% of both the males and females in the Kamisugamata Section.

By disease, 10 cases (10.2%) of sinus bradycardia stand first in number, 5 cases (5.1%) of ventricular premature beats stand second and findings are seen in 25 cases (25.5%).

When the rate of finding-holders, male and female, of over 40 years in the former section is compared with that of the latter section, no statistically significant difference can be seen between the sections and the sexes of each age-group.

Nevertheless, the rate of finding-holders in the latter section is higher than that of the former section in both the males and females of each age-group except females in their sixties and seventies. This may be due to fatigue in the busy farming season.

3 Results of urine examination

In the Shimogo Section (Sept. in 1976) nobody was suffering from abnormal urobilinogen reaction of urine, as is shown in Table 6. 2 males and no females were suffering from albuminuria, and 2 males (8.7%) were suffering from glycosuria.

In the Kamisugamata Section (April in 1977) as many as 2 males (11.1%) and 12 females (35.3%) were suffering from abnormality (increase) of urobilinogen reaction of urine.

As is shown in Table 6, this seems to be due to fatigue in the busy farming season, as in the case of ECG.

As to albuminuria, 2 males (11.1%) and 4 females (11.8%) were light positive and 1 female was moderate positive. As to glycosuria, 1 female (2.9%) was suffering from it.

As compared with the former section, the latter section has more males and females positive in urobilinogen reaction, and the difference is statistically significant at the level of 1.0% by X^2 -test ($X^2 = 14.84$) in the case of the females, though insignificant in the case of the males.

As to albuminuria, more sufferers from it are found in the latter section, and the difference is significant at the level of 5.0% by X^2 -test ($X^2=3.58$) in the case of the females, though insignificant in the case of the males.

Table 6 Results of Urine Examination by Sex, Year and Section

Section	Shimogo (September, 1976)												Kaniugamata (April, 1977)						Total of Examinees																	
Year Sex	20 – 29						30 – 39						40 – 49						50 – 59						60 – 69						70 –					
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀						
Examinees	1	1	3	1	5	5	9	9	2	9	3	4	4	3	5	13	5	15	4	3	23	100.0	29	100.0	18	100.0	34	100.0								
0.1 (Normal)	1	1	3	1	5	5	9	9	2	9	3	4	4	2	4	12	5	7	3	1	23	100.0	29	100.0	16	88.9	22	64.7								
1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	8	1	2	0	0.0	0	0.0	2	11.1	12	35.3								
—	1	1	2	1	5	5	8	9	2	9	3	4	2	2	5	12	5	12	4	3	21	91.3	29	100.0	16	88.9	29	85.3								
±	0	0	1	0	0	1	0	0	0	0	0	0	2	1	0	1	0	2	0	0	2	8.7	0	0.0	2	11.1	4	11.8								
+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.0	0	0.0	0	0.0	1	2.9								
—	1	1	3	1	5	5	7	9	2	9	3	4	4	3	5	12	5	15	4	3	21	91.3	29	100.0	18	100.0	33	97.1								
+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.0	0	0.0	0	0.0	1	2.9								
++	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4.3	0	0.0	0	0.0	0	0.0								
+++	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4.3	0	0.0	0	0.0	0	0.0								

III SUMMARY AND DISCUSSION

It has long been suggested that the law of Poiseuille²⁾³⁾ is related to blood pressure. Clinically speaking, the following seem to be factors⁴⁾⁵⁾ in the development of hypertension — a renal factor concerned with renin-angiotensin system, an endocrine factor implicated in catecholamines or aldosterone and a neurogenic factor.

Hygienically⁶⁾ it is a matter of common knowledge that heredity⁷⁾, season⁸⁾ or temperature⁸⁾, food⁹⁾, especially salt¹⁰⁾ intake, and labour¹¹⁾¹²⁾, etc. may be factors.

In Japan, maximum blood pressure of higher than 150 mmHg has been considered to be hypertension¹³⁾ and that of lower than 100 mmHg to be hypotension¹³⁾

At present, clinicians commonly regard maximum blood pressure of higher than 140 mmHg and minimum blood pressure of higher than 90 mmHg in the case of young people, and maximum blood pressure of higher than 150 mmHg and minimum blood pressure of higher than 90 mmHg in the case of elderly people as hypertension, and except in case of life and death, they observe the patients for a certain period with no antihypertensive drugs.¹⁴⁾¹⁵⁾

Now that our national physique has recently improved, the value of blood pressure in healthy young, mature and elderly people has come to be divided according to the classification of WHO.

As to the average value of blood pressure of people of over 40 years in the present investigation, no statistically significant difference can be seen between the sections and sexes. However, maximum blood pressure of higher than 150 mmHg was observed in more females in the former section statistically at the level of 5.0%. This seemed to be due to their overwork in the busy farming season, for in the former section their blood pressure was measured in September, 1976 — the relatively slack season and in the latter section in April, 1977 — the busy farming season.

It is possible that their blood pressure was lowered by the effect of temperature and, as Nishikawa¹¹⁾ and Takahashi¹²⁾ pointed out, overwork.

As to ECG findings, 3.3% of the males and 31.0% of the females in the former section are sufferers, while 31.0% of both the males and the females in the latter section are sufferers. As mentioned above, ECG findings are seen in more males in the latter section, though the difference is statistically insignificant. This may be due to their overwork in the busy farming season. The rate of finding-holders is higher than that of Nango Village (males 12.8%, females 12.7%¹⁶⁾¹⁷⁾) in Fukushima Prefecture, which was investigated by us in June, 1976, and this rate is near to the rate of 20.0% of the males and 36.2% of the females in the whole prefecture of Nagano, which was investigated by the Prefectural General Health Center¹⁸⁾.

According to the results of urine examination, the positive rate of urobilinogen in the latter section is higher than that of the former section, which may, as mentioned above, be due to fatigue in the busy farming season.

It is of great interest that this is in accord with the lower value of blood pressure and higher rate of ECG findings of the people in the latter section, where their fatigue of farm work seriously affects their health.

IV CONCLUSIONS

We made investigations of the 53 persons in the Shimogo Section on the 14th of September, 1976, and of the 54 persons in the Kamisugamata Section on the 16th and 17th of April, 1977, and came to the following conclusions.

1) The average and the standard deviation of maximum and minimum blood pressure of the males of over 40 years in the Shimogo Section are 137.3 ± 18.7 mmHg and 83.0 ± 11.6 mmHg, and those of the females in the same section are 151.4 ± 28.0 mmHg and 79.9 ± 12.8 mmHg, while those of the males of over 40 years in the Kamisugamata Section are 137.1 ± 21.2 mmHg and 81.4 ± 9.9 mmHg, and those of the females in the same section are 140.7 ± 18.1 mmHg and 81.3 ± 11.3 mmHg. No statistically significant difference can be seen between the sections and sexes. The former section has more females suffering from blood pressure of higher than 150 mmHg with a statistically significant difference at the level of 5.0%.

2) ECG findings can be seen in 8.3% of the males and 31.0% of the females in the former section and in 31.0% of both the males and females in the latter section. The males in the latter section have more findings than those of the former

section, though the difference is statistically insignificant. This may be due to their overwork in the busy farming season.

3) As to positive reaction of urobilinogen in urine (an abnormal increase), nobody is suffering from it in the former section, while as many as 2 males (11.1%) and 12 females (35.3%) are suffering from it in the latter section. This seems to be due to their fatigue in the busy farming season.

As to albuminuria, 2 males and 5 females in the latter section are suffering from it.

As to glycosuria, 2 males in the former section and 1 female in the latter section are suffering from it.

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〈要 約〉

農村(栃木県)の衛生学的研究(Ⅲ)

第2報 茂木町の集団検診—血圧,心電図所見並びに検尿成績について

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農村(栃木県)の衛生学的研究(Ⅰ), 栃木県及び過疎町村の一般的観察成績ならびに人口指数その他について, 民族衛生第42巻(1976)に報告し, 農村(栃木県)の同研究(Ⅱ), 農作物ならびに青果物収穫量と市町村別訂正死亡率その他との関係について, さらに農村(栃木県)の同研究(Ⅲ)第1報茂木町の集団検診, 頭部, 顔面所見及び打聴診所見 (Hygienic Studies of Farming Villages in Tochigi Prefecture (Ⅲ), Report I, Group medical Examination on the Cephalic, Facial, Percussive and Auscultatory Finding)と題し, 茂木町下郷ならびに上菅又地区住民の頭部顔面所見, 体位, 体型, 打聴診所見, ならびに皮膚所見について同誌に報告した。本報では, 引き続いて, 前地区住民の血圧, 心電図所見, 検尿成績について述べる。

1976年9月下郷地区53名, 1977年4月上菅又地区54

名の集団検診を行なった結果, 下郷地区40才以上者の平均血圧は, 男:最高血圧 $137.3 \pm 18.7 \text{ mmHg}$, 最低血圧 $83.0 \pm 11.6 \text{ mmHg}$, 女:最高血圧 $151.4 \pm 28.0 \text{ mmHg}$, 最低血圧 $79.9 \pm 12.8 \text{ mmHg}$ で, 上菅又地区40才以上のそれは, 男:最高血圧 $137.1 \pm 21.2 \text{ mmHg}$, 最低血圧 $81.4 \pm 9.9 \text{ mmHg}$, 女:最高血圧 $140.7 \pm 18.1 \text{ mmHg}$, 最低血圧 $81.3 \pm 11.3 \text{ mmHg}$ であった。女の最高血圧 150 mmHg 以上の者は, 統計学的に5%以下の危険率で有意差をもって下郷地区に多かった。

心電図所見では, 下郷地区の男8.3%, 女31.0%に, 上菅又地区の男女とも31.0%に所見がみられ, 農繁期労働が影響しているものと考えられる。

検尿成績でも, 下郷地区では, ウロビリノーゲン陽性が, 1名もなく, 上菅又地区の男11.1%, 女35.3%にウロビリノーゲン陽性がみられ, 心電図所見と同じように農繁期労働による影響がみられた。

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