The Geographical Study of "Seasonal Diseases" (1)

— Tentative Calendars of "Seasonal Diseases" in Japan —

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Abstract

It is well known that the occurrence of diseases and deaths is often connected with seasonal conditions, but there are not a few diseases which have little relationship with climatical and seasonal changes, and opinions differ among medical scientists as to the definition of seasonal diseases. In this paper, therefore, the author does not intend to discuss this point, but to present a tentative survey of death rates by disease and their geographical variations in prewar and postwar Japan. Thus, it is simply for sake of convenience that those diseases for which the death rates fluctuate seasonally are regarded as "seasonal diseases" in this paper, but the author believes that some facts found in the seasonal fluctuations of death rates by disease claim serious analysis and study from the standpoint of medical geography.

1. Month-by-month Fluctuations of Death Rates by Disease

The monthly death rate P_i ($i=1, 2, \dots, 12$) is calculated by the following formula:

$$P_i = \frac{di/mi \times 365}{N}$$

where di indicates the number of death by month, mi the number of days in the i th month of the year, and N the population. The month-by-month death rates (per 100,000 of population) are thus calculated on the basis of official death statistics for 14 important diseases in Japan from 1930 through 1934. The death rate curves by year of pneumonia and bronchitis in Hokkaido and of apoplexy in Tokyo are shown in Fig. 1 (a) and (b), respectively. It can be seen that the similar curves appear every year. Almost the same was the case with other ailments.

Fig. 2 shows the death rate curves by disease in Tokyo. It reveals that deaths from pneumonia and bronchitis are quite frequent in the months of January, February and March. As for influenza, the peak stands in the same season but is much lower with

the death rate at 50 or so.

In the case of whooping cough, a small peak occurs not in winter but in summer.

Fig. 1. (a) The death rate curve by year of Pneumonia & Bronchitis in Hokkaido.

Fig. 1. (b) The death rate curves by year of Apoplexy in Tokyo.

Fig. 2. The death rate curves by diseases in Tokyo.

Other illnesses for which the death rate is the highest in winter are such senile diseases as apoplexy, heart disease and senility. For them, the peak of the death rate curve takes place from December through March.

In the summer months (July, August and September), on the other hand, the death rate curves up to the summit for typhoid, dysentery, gastritis and enteritis. But the summit is relatively low, or less than 50, except for gastritis and enteritis.

Measles usually registers the highest death rate early in summer, or May and June,—a noteworthy difference from other ailments.

It is also worthy of special mention that the death rate curve follows a crab-like course in the case of tuberculosis. There is no fixed peak seasonally and locally.

Conditions are almost the same for cancer. In Tokyo, the peak of the death rate stands in September, but this is not the case with other localities as will be explained later.

2. Tentative Calendars of Seasonal Diseases by Locality

Based upon the foregoing survey of death rates by disease, the author has prepared the tentative calendars of seasonal diseases for five representative localities in Japan from the north to the south, namely Hokkaido, Iwate prefecture, Tokyo Metropolis, Osaka prefecture and Kagoshima prefecture. These are shown in Fig. 3 (a), (b), (c), (d) and (e): the season of prevalence classified by death rates is indicated by the shaded graph. Incidentally, the season in which the monthly death rate is clearly higher than the annual average rate from the statistical point of view (due allowance made for any accidental fluctuation) is regarded as the season of prevalence.

From seasonal disease calendars of this kind, one can easily find out what disease is most prevalent and when in a given locality, and it will be possible, if necessary, to take necessary countermeasures.

3. Significance of Geographical Variations

Fig. 3 shows that marked differences exist in the season of prevalence one disease from another and one locality from another. Responsible for such differences are a number of geographical and socio-economic conditions,

closely interconnected with one another. A complete and comprehensive analysis of these conditions by disease and by locality is really an impossible proposition, but the author wants to refer to some interesting findings.

Diseases of the respiratory organs are naturally most prevalent in winter. Reasons are twofold: 1) human bodies are easily infected by pathogenic bacteria of these illnesses due to cold weather, and 2) living conditions in winter, especially in small rooms not well ventilated, lead to the frequent infection with pneumonia and bronchitis. The most salient geographical variation is witnessed in Iwate prefecture: i.e. not only the death rate is the highest, but also the prevalence season is the longest for pneumonia and bronchitis, probably indicative of the low cultural standard there.

Different from other ailments of the respiratory organs, whooping cough is most prevalent in summer. Reasons are still unknown, but it is likely that there are some important non-seasonal factors for summer prevalence. It is worth mentioning that in Iwate prefecture, this disease is most prevalent in February, and that it breaks out twice a year in some other prefectures. In both cases, however, no definite factor can yet be identified.

Gastritis, enteritis, dysentery and typhoid, on the other hand, are most prevalent in the summer season. There is no need to explain the pathological and physiological factors responsible for this phenomenon, but it is interesting to note that almost similar geographical variations occur as in the case of pneumonia. In Iwate prefecture, for instance, the summer prevalence is much severer than in other prefectures again owing to the unsatisfactory cultural and socioeconomic conditions.

In Tokyo, typhoid cases break out frequently twice a year, or in winter and summer. A reporter attributes this exceptional phenomenon to the eating of fresh oysters.

As for tuberculosis, no seasonal prevalence is seen in Tokyo and Kagoshima. But the disease is prevalent in May in Iwate, from July through September in Osaka; and from March through June in Hokkaido. The March-June prevalence in Hokkaido is ascribed to the special way of living there: namely, peo-

ple live in well heated but not fully ventilated rooms in winter, and this probably causes the frequent deaths from this disease in this season.

Such living conditions in Hokkaido, however, appear to bring about encouraging effects in the case of apoplexy, for the death rate from this illness is low in spite of the cold climate there, probably because people live in well heated rooms in winter. In Iwate where rooms are seldom heated by stoves, on the other hand, deaths from this senile disease are most prevalent in winter. In this prefecture, room temperature is far lower than in Hokkaido. As reasons for the very high death rate for this disease there can be mentioned, in addition to the cold climate, the following conditions:

1) heavy farm work incidental to rice growing, and 2) bad diet coming from poverty among the farming population.

The prevalence of cancer is non-seasonal except in Kagoshima, where cases frequently occurs for a long summer season, or from June through October. This prefecture is the hottest district in Japan, and cancer is prevalent in the hot season. Doesn't this indicate its close relationship with hot climate?

Beriberi coming from the lack of vitamin B₁ is most prevalent in the July-August season in every prefecture. This is because hot and wet climate in this time of the year and some other factors cause the lack of vitamin B₁ in human bodies. But there are noteworthy geographical differences in the death rate: i.e. the death rate is less than 20 even in Iwate and Kagoshima but as high as 50-100 in Osaka or one of the biggest industrial centers in Japan. Frequent deaths from this disease in such an industrial city can be attributed to the unsatisfactory living and working conditions among working people.

From the foregoing, it may be concluded, the seasonal prevalence of diseases is caused by three factors: namely, 1) seasonal changes bring about indirect effects to bear upon the pathological processes of diseases, 2) these changes cause indirect effects to bear upon the pathological processes by creating corresponding changes in other natural conditions through the medium of socioeconomic conditions, and 3) these direct and indirect effects

Tentative calendars of "Seasonal diseases" in Japan
Postwar Period (1952-56)

Fig. 4. (a) Hokkaido

Tentative calendars of "Seasonal diseases" in Japan
Prewar Period (1930-34)

Fig. 3. (a) Hokkaido

Tentative calendars of "Seasonal diseases" in Japan
Postwar Period (1952-56)

Fig. 4. (b) Iwate-ken

Tentative calendars of "Seasonal diseases" in Japan
Prewar Period (1930-34)

Fig. 3. (b) Iwate-ken

Fig. 3. (c) Tokyo-to

Fig. 4. (c) Tokyo-to

Fig. 4. (d) Osaka-fu

Fig. 3. (d) Osaka-fu

Fig. 4. (e) Kagoshima-ken

Fig. 3. (e) Kagoshima-ken

appear at the same time. To fully clarify the pathological processes of seasonal diseases, it is essential for us to identify the socio-economic factors causing indirect effects. For this purpose, however, geographers will have to cooperate with economists and sociologists.

4. Comparison of Prewar and Postwar Calendars of Seasonal Diseases

Another important finding is the marked differences between the prewar (1930-34) and the postwar (1952-56) calendars of seasonal diseases. The death rates have visibly decreased for all ailments from the prewar to the postwar periods, and noteworthy changes have taken place in the seasonal prevalence of many diseases as may be noted in Fig. 4 (a), (b) and in Fig. 5 (a), (b), (c), (d) and (e).

Fig. 5. (a) Comparison of the death rate curves of Pneumonia & Bronchitis in Pre-war and Post-war.

Fig. 5. (b) Comparison of the death rate curves of Apoplexy in Pre-war and Post-war.

For whooping cough and influenza, the death rate has dropped to less than 10 in all the prefectures covered in this survey. Not only that, whooping cough has become non-seasonal except in Tokyo. For pneumonia and bronchitis, the death rate has curved off to about 50-100, but it still remains as high as 100-200 in Iwate prefecture, where the prewar rate was also the highest in the whole country. (Fig. 5 (a), Fig. 6 (a)).

A similar decrease in the death rate has been witnessed also in the diseases of the digestive organs. As for typhoid, deaths have become seldom in many prefectures. Especially low is the postwar death rate for gastritis and enteritis. (Fig. 6 (b)) In Iwate, however, deaths from these two ailments are still high though a marked drop has been seen from the prewar rate, and their prevalence is still seasonal—another fact indicating the low cultural standard in this prefecture. In Tokyo, gastritis and enteritis are prevalent, though on a very low level, twice a year: i.e. early in September and from December through February. It is also to be noted that the death rate is somewhat higher in winter than in summer.

As for tuberculosis, the death rate has substantially tapered off in all the prefectures, and it now stands at 50-100. In Iwate Hok-

Fig. 6. (d) Calendar of Beriberi.

Fig. 6. (c) Calendar of Tuberculosis.

Pre-war period (1930~1934)

Post-war period (1952~1956)

Fig. 6. (g) Calendar of cancer.

kaido and Tokyo, it is prevalent in winter as it was before the winter. In Osaka, however, its prevalence has moved from summer to winter. In Kagoshima, there is no seasonal fluctuation in the death rate prewar years. (Fig. 6 (c))

In the case of beriberi, not only the death rate has declined markedly, but also geographical variations have almost disappeared. In Osaka, the death rate was the highest prior to the war due probably to the bad living conditions among plant workers, but it has substantially slipped off since the war's termination thanks to the wider use of vita-

min preparations and the improvement of food and other living conditions. It deserves special attention that this disease now is prevalent in winter in most prefectures, where it was prevalent in summer before the war. (Fig. 6 (d))

No tangible change has occurred in the death rate for heart disease and apoplexy. For the former, the death rate now stands at 50-100, or the same level as in the prewar years, and the season of prevalence is from December through March, though there are some geographical variations in length of the season. (Fig. 6 (e))

As for apoplexy, the death rate has experienced no change in Hokkaido, but the postwar rate is much lower than the prewar level in all other prefectures. (Fig. 5 (b)) In Iwate, the rate still is as high as 200-250 compared with well over 250 before the war, and this means that the prewar discouraging conditions still remain unrectified there. In every prefecture, the death rate stands at the same level, or 50-60, in the prewar and postwar years. (Fig. 6 (f))

In the case of nephritis, the death rate has slipped by 50% in all the prefectures. It is

notable that it is 40-50 in Kagoshima, or much lower than in other districts.

As for cancer, the death rate in the season of prevalence is almost the same as it was before the war, but there has occurred a noteworthy change in seasonal prevalence. Before the war, there was no seasonal prevalence in Hokkaido and Iwate, but since the war's end the disease has been prevalent in summer. In the other districts, except Kagoshima, postwar prevalence takes place in November. (Fig. 6 (g))

Deaths from senility have decreased, though slightly. In Osaka, the death rate had two

peaks in a year, or in summer and winter, before the war, but the postwar curve has only one summit, or in winter as is the case in all other prefectures.

From the foregoing, it may be concluded as follows :

For most of the seasonal diseases long regarded as summer ailments, including beriberi, whooping cough and typhoid, the summer upcurve of the death rate, long seen prior to the war, has disappeared, and prevalence has come to take place mostly in winter. Even in the case of such diseases as have been regarded as winter illnesses (e.g., heart disease, apoplexy and senility), the death rate is as high as ever in winter.

As for those diseases which can be cured with antibiotics (whooping cough, pneumonia, bronchitis, dysentery, gastritis, enteritis, tuberculosis, etc.), the death rate has re-

markably decreased in both winter and summer. In the case of those ailments for which the death rate climbed up to the peak in summer, the season of prevalence has practically disappeared since the war's end, or it has moved from summer to winter.

Since the war's end, deaths from beriberi have been on the steady decline in all parts of Japan due to the improved food supply situation, and this ailment now is also more prevalent in winter than in summer.

It is self-evident that the geographical and seasonal variations of these diseases are caused not only by the natural environments but also by the socio-economic conditions (the way of life, medical progress, etc.). It can further be said that the marked seasonal changes in the prevalence of popular diseases speak of the backwardness in social development, especially the low standard of living.

季節病の医学地理学的研究 (1)

—— 日本の季節病カレンダー ——

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季節病の分布様式を、季節病カレンダーを通して地域的に——北海道、岩手、東京、大阪、鹿児島——戦前、戦後の比較を試みながら検討した。季節病としては肺炎、気管支炎、結核、脚気、脳出血など 14 種類を選び、それぞれ月別死亡率を算出し、各疾病による死亡の多い季節——流行期——をきめ、死亡率に階級区分をほどこして図示したのが季節病カレンダーである。

このカレンダーから種々な事実が読みとれるが、なかでも戦前、戦後の比較は注目に値する。即ち戦後は夏季に流行期のみられた脚気をはじめ、百日咳、腸チフスなどの流行期が消失して、むしろ冬季に流行期が移行してきている。また地域によつて夏に流行期のみられた結核や老衰も冬にきている。癌も 11 月を中心に山がでてきて、これも戦前よりやや冬の方に近よっている。しかしもともと冬の季節病である心臓病や脳出血は、戦後もそのまま冬に流行期を示す。このように季節病の夏の流行期が消失して、冬に流行期を示す冬季型に変わりつつあるが、この傾向は文化の発達した地域ほど早くあらわれるようである。

また地域的、歴史的の分析から、季節病の分布様式は決して気候的な自然条件だけで決定されるものではなく、地域独自の生活様式、社会経済的条件、医薬の進歩など種々な条件で決定されることがわかった。