in spite of the application of scientific knowledge to such a country as India, Nature will always provide suitable and satisfactory checks upon population. The checks which Nature may impose ought therefore to be considered.

Warfare is a post-natal check which acts for a period, but its effects are largely on the male section of the community. Apart from the reduction of the numbers of males brought about directly by death in action and death from wounds, there are also certain other less-specialized losses which may result from war. For example, the destruction of crops may lead to wholesale malnutrition or even the starvation of large numbers of the general population. The conditions of existence imposed by warfare will frequently tend to increase the virulence and the rapidity of spread of disease. The influenza epidemics of 1917 and 1918 were held responsible for more deaths than were caused by enemy action. Moreover, like war, catastrophes of Nature, such as floods and earthquakes, may have both direct and indirect consequences. The floods which occur periodically on the Yellow River in China, for example, may result in numerous deaths from drowning. The 1934 Bihar earthquake caused the death of thousands of persons directly, and the death of thousands indirectly owing to starvation. In the Quetta earthquake 25,000 persons are said to have been killed. The deaths due to starvation and disease consequent on such catastrophes often exceed the deaths caused directly.

Furthermore, in densely populated areas numbers of deaths from starvation, or from disease to which malnutrition predisposes, may be expected to follow upon crop failures due to such milder derangements as excessive drought or frost. The existence of a Famine Code in India and of an Indian Famine Trust, intended to give monetary assistance to persons in districts affected by a shortage of rainfall, indicates the seriousness of the risks even now being constantly run in that country. Many diseases, especially in epidemic form, may wipe out a large proportion of a local population; influenza and plague are instances of disease which may reduce populations over fairly wide areas. Among the post-natal checks on population one of the most important in countries with low standards of living is excessive infant mortality.

With the exception of warfare, all the foregoing post-natal checks may be classed as involuntary, inasmuch as normal people would avoid them if they could. But in the post-natal period there are also voluntary checks, and these the parent or the community can apply. Infanticide by exposure of unwanted children and by other means in several countries not unknown even to-day. The killing of twins, as practised among certain peoples, is a system which, whatever its original significance, may have some effect in limiting population by preventing twin-bearers from reproducing.

Natal checks include stillbirths and deaths of mothers at childbirth. How important the natal factor is can be concluded from the stillbirth rates and the high figures of maternal mortality. The figures given by Megaw for maternal mortality are worth noting here. He estimates that in India 200,000 mothers die in childbirth every year.

Prenatal Checks

Prenatal artificial checks in the post-conception period include all methods at present employed for causing miscarriage or producing abortion. The reduction of population which results from these means comprises all children unborn and all the mothers who succumb to the effects of the drugs used or of the mechanical operations performed, as well as all the later children who might have been born to these mothers had they survived. It may be observed that none of these prenatal methods can be considered devoid of risk. The safe production of even early abortion involves a surgical operation which requires precaution if it is to give the mother a fair chance of survival in a good state of health. As regards preconception checks, we may here leave out of consideration mechanical means of sterilization of the male and female. These are also operative procedures which involve risks. It may be possible to impose them by statutory means on those whose offspring are not welcomed by the State, but only in the case of persons who are not free. They are never likely to be accepted voluntarily by any large number of free peoples.

Among normal and civilized people it is at a stage before conception has occurred that a check on population is most often adopted and may most safely be undertaken. One method—that which is called the ideal one—is for men and women to abstain voluntarily from marriage, or, more broadly speaking, from reproduction. Religious celibacy has its effect on population, as also has secular common prudence, as when men put off marriage till late in life because they cannot afford to keep a wife and children. But much more usually it is the employment of contraceptives which provides the solution of any dreaded over-population problem among careful people with forethought. To what extent, if any, the frequent use of chemical or mechanical contraceptives finally impairs health is as yet by no means certain, and no doubt it will be some years before convincing evidence can be collected and sifted. That the immediate physical and mental risks are not considered great, however, seems already to be widely accepted.

Conclusion

We may sum up by concluding that if the world achieves lasting peace, if the maximum productive use of land is practised, and if, moreover, there is a sustained effort to apply our knowledge to the betterment of the health of man by attention to the prevention of disease and to improving housing, environment, and nutrition, then India, with all these newly acquired aids towards increase in the numbers and the good health of families, will be so rapidly populated that starvation will inevitably result, and that soon. In order to avert this it will be necessary for the politicians and administrators of India—as it presently will be for those of certain other countries—to make up their minds on what is to be their standard of living, and on the number of people which the land will support at that standard. Having determined this, they will then be compelled either to educate their peoples up to a high level of moral restraint or to educate them in the practice of contraceptive methods. Only so will they be able to limit the numbers of the population to the figure indicated by those standards of living which they have chosen, and to avoid the starvation of many of their people.

INFECTIVE HEPATITIS

WITH SPECIAL REFERENCE TO THE ORAL HIPURIC ACID TEST

BY

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During the period Dec., 1941, to Sept., 1942, there were admitted to hospital 168 cases of infective hepatitis in the Middle East Forces. This figure does not include 50 cases of jaundice in persons undergoing antisyphilitic treatment, which are considered elsewhere. The patients came from certain base units, from rest and training camps, and from the forward areas in the Western Desert. The epidemic reached its peak in the early autumn (September), but figures showing the seasonal incidence would be misleading, since there were often large troop movements in the area served by the hospital. For the same reason it was difficult to trace contacts and so to assess accurately the incubation period of the disease. It was estimated at 4 to 5 weeks. Booth and Okell (1927-8) consider the incubation period to be not less than 20 and not more than 40 days. Excellent epidemiological studies have been carried out in rural districts in England by Pickles (1930, 1939) and Newman (1942), who have brought forward fairly conclusive evidence of an incubation period of 26 to 35 days.

Onset and Pre-icteric Stage

The disease for the most part affected the apparently healthy. In the war of 1914-18 so-called catarrhal jaundice was common in the Middle East. Bacillary dysentery and diarrhoea were so frequently associated with the onset of the illness that

a suggestion was put forward that there was a definite relationship between the two diseases. In this series dysentery and diarrhoea were associated with the onset in only 19 cases. This remarkable difference is not due to any change in the character of the disease, but is the result of more efficient hygiene and sanitation, which during this war has been a feature in the Middle East.

A few epidemics have been associated with sore throat, notably those recorded by Fraser (1935) and Glover and Wilson (1931). No such association was noted here. General debility, sore throat, respiratory infection, or skin sepsis preceded the onset of the disease in only 8 cases. While there was wide variation in the clinical picture in the pre-icteric stage, two fairly distinct types of onset were recognized: (1) cases in which there occurred a well-marked febrile attack, and (2) cases in which no febrile attack was observed. In the great majority of cases the pre-icteric stage had passed and jaundice had developed before admission to hospital, but in such cases notes on the prodromal symptoms from regimental medical officers were of great value. Only occasionally was it difficult to determine the type of onset.

Group 1: 88 Cases with Febrile Attack

The onset was usually sudden, often with shivering and occasionally with a rigor. Fever ranged from 100° to 102°, the highest recorded temperature being 104°. The pulse rate usually varied from 80 to 90, and often dropped to 50 or 60 when jaundice became established. Headache, mostly frontal or retro-ocular, was common, and was noted in 85%. It was rarely bitemporal or occipital. A few patients complained of photophobia and pain on movement of the eyes. Giddiness was noted occasionally, and malaise, rarely amounting to lethargy, was almost constant. Two-thirds complained of backache and/or pains in the limbs.

Gastro-intestinal symptoms were universal in some form or another, and sometimes their appearance was delayed until the third or fourth day of the illness. Loss of appetite was complained of in all but three cases, and nausea, vomiting, and abdominal pains or discomfort were common. Constipation occurred in just over one-third, and mild diarrhoea in 9%. The average duration of this prodromal stage before the appearance of jaundice was 5.8 days, and in one case it lasted as long as 17 days.

Group 2: 80 Cases without Febrile Attack

The pre-icteric stage in this group was of slightly shorter duration, averaging 4.1 days. In 8 cases jaundice was the first symptom to be noted, and the longest duration of this stage was 18 days. Slight frontal headache was complained of in one-third, and, though no definite febrile attack occurred, a few cases had fever from 99° to 100°. The great majority, however, were afebrile.

Gastro-intestinal symptoms were evident from the first and, though similar to those in the "febrile" group, were not so constantly present. A number of patients complained of relatively few gastro-intestinal symptoms, and 8 would admit

TABLE I

	Cases with Febrile Attack	Cases without Febrile Attack
	(%)	(%)
Shivering	76	—
Retro-ocular headache	34	2.5
Frontal headache	51	32
Backache and limb pains	64	14
Anorexia	97	83
Nausea	85	71
Vomiting	56	49
Abdominal discomfort or pain	51	45
Constipation	36	25
Diarrhoea	7	9
Duration of pre-icteric stage	5.8 days	4.1 days
Duration of jaundice	23.4 "	25.3 "

of no previous symptoms whatsoever. In most cases anorexia was complete; in others (17%) appetite for food remained good or was only slightly affected. Many patients said they would sit down to a meal, but after eating a few mouthfuls

of food the nausea was so intense or the feeling of distension in the abdomen so great that they could eat no more. Malaise, a bad taste in the mouth, and disinclination for smoking were common. Vomiting, especially after fatty foods, was noted in 49%. Abdominal discomfort or pain was complained of in the right hypochondrium or mid-epigastrium, and was described as a soreness, fullness, tightness, a dull ache, a feeling of distension, or, rarely, as severe pain. Sometimes this discomfort was confused with nausea. Heartburn and flatulence were not uncommon, and in one-quarter the bowels were constipated. Suffusion of the conjunctivae, as noted by Bates (1936) and Newman (1942) in children, was not observed. In both groups dark urine was noticed usually one to two days before the onset of jaundice.

Icteric Stage

After the appearance of jaundice the physical findings and subsequent clinical course were *almost identical* in all respects in the two groups. When jaundice became evident, first in the conjunctivae and then in the face and neck, fever in Group 1 abated and all constitutional and gastro-intestinal symptoms tended to disappear. In fact, as soon as the yellow tinge of jaundice appeared most patients began to feel well and to eat heartily. Very occasionally low fever continued for a day or two in the icteric stage.

The persistence, for a few days in the icteric stage, of anorexia, nausea, abdominal discomfort, and sometimes of vomiting occurred in one-quarter of all cases, and the symptoms were generally associated with clay-coloured stools. With the return of pigment in the stools the troublesome symptoms usually disappeared. Vomiting was so severe in 3 cases that intravenous saline with glucose was administered, with rapid improvement. Paresis of accommodation—a serious symptom—occurred in one deeply jaundiced patient, but disappeared quickly after the administration of glucose-saline intravenously. The tongue was clean in the majority of cases—an interesting observation in view of the fact that disorder of the liver is commonly said to be associated with a coated tongue. Tenderness in the epigastrium and in the right hypochondrium was common.

Enlargement of the liver was detected in 49% of cases in Group 1 and in 51% in Group 2. The liver became palpable and was almost invariably tender at the first appearance of jaundice or, less commonly, within a few days of its onset. The liver edge extended on the average to 1½ fingerbreadths below the right costal margin. There was a definite relation between the size of the liver and the duration of the icteric stage. Though in a few cases of prolonged jaundice the liver never became palpable, it is clear (Table II) that the larger the liver the longer the duration of jaundice. In giving a prognosis it is helpful to remember that gross hepatomegaly is associated with severe and persistent jaundice. The enlargement in the average case lasted for about a week. In some cases hepatomegaly was transient, lasting for only two to three days; in others it persisted for three to four weeks.

TABLE II

No. of Cases	Size of Liver	Average Duration of Jaundice
2	3-4 f.b.	62.0 days
19	2-3 f.b.	34.4 "
63	1-2 f.b.	24.4 "
84	Not palpated	20.0 "

The spleen was palpable in 6 cases in Group 1 and in 10 cases in Group 2 (average total, 10%). The enlargement usually disappeared within a week, and in all but one case was associated with hepatomegaly.

Duration of Jaundice.—In over two-thirds of cases jaundice lasted from 15 to 35 days. It usually developed rapidly and reached its maximum within a few days; after a varying time it began to fade slowly. The depth of jaundice varied considerably, and in a few cases only the conjunctivae were tinged. In "febrile" cases the average duration of jaundice was 23.4 days, and in the "non-febrile" group it was 25.3 days; 24 cases (14%) out of 168 had an icteric stage which lasted more than 35 days, the longest duration being 81 days.

Leucocyte Count.—The leucocyte count in the pre-icteric stage and during the first three days of jaundice ranged from 3,100 to 8,800 per c.mm. (average 5,800 per c.mm.). A leucopenia with a relative lymphocytosis and monocytosis is described as a common finding, and this was present in a number of cases. It was more common, however, for the leucocytes and the differential count to be within normal limits. The average differential count during the first three days of icterus was (20 cases): polymorphonuclears, 55% (44-64%); lymphocytes, 39% (30-52%); monocytes, 5% (1-10%). (Other cells not included.)

Stools.—The stools were clay-coloured or light brownish at some time or another in the majority of cases. Their appearance was usually noticed by the patient at or before the onset of jaundice, but was sometimes delayed until jaundice had been well established. In a few cases they appeared intermittently, and in others every stool passed was well coloured with pigment.

Urine.—Dark-coloured urine was noticed by most patients one or two days before the appearance of jaundice; but sometimes it was observed every day during the previous week, and 11 patients said they had noted dark urine 7 to 14 days before the occurrence of jaundice. A small quantity of albumin was found in the urine of a few patients during the first two or three days of jaundice, and in some instances occasional granular and hyaline casts were present. In 60 cases an early morning specimen of urine was examined daily or on alternate days for bile (Gmelin's test), bile salts (Hay's sulphur test), and excess urobilinogen (Ehrlich's diazo reagent). The average duration of bilirubinuria as estimated from the day of appearance of jaundice was 14 days, and bile salts were detected for three to four days after the test for bile became negative. It will be generally agreed that both Gmelin's nitrous acid test and the iodine ring test for bile pigment in the urine are unsatisfactory, since in the latter stages of jaundice, when excess bilirubin is still present in the blood, these tests for bile are negative. Excess urobilinogen was found in the late pre-icteric stage and in many cases during the first few days of jaundice. The test was usually, but not invariably, positive when the stools were clay-coloured or light brown. This may be regarded as evidence that stoppage of bile-flow was usually incomplete, since the formation of urobilinogen depends on the presence of bile pigment in the intestine. It has already been shown (van Rooyen and Gordon, 1942) that, in cases of infective hepatitis when the stools are clay-coloured, quantities of bile can be obtained by duodenal intubation. Occasionally, however, excess urobilinogen was absent in the presence of clay-coloured stools. In one severe case, in which jaundice lasted 55 days and the stools were clay-coloured for 14 days, excess urobilinogen was never present in the urine. Probably in this case there was complete stoppage of the flow of bile, so that in the absence of bile in the intestine no urobilinogen was formed.

Diagnosis in the Pre-icteric Stage

The initial febrile attack in cases in Group 1 resembled, and was often confused with, sandfly fever and malaria, but the distinguishing feature in these cases was the presence of gastro-intestinal symptoms, especially anorexia and nausea. Diagnosis was difficult when the appearance of these symptoms was delayed for a few days.

Pneumonia, meningitis, and septicaemia had occasionally to be excluded when fever was high in the pre-icteric stage, and in such cases the leucocyte count was of great assistance. The enteric group of fevers, especially paratyphoid fever, had not infrequently to be considered. In 2 cases abdominal pain was so severe that a diagnosis of acute appendicitis was made by the medical officer. In patients without an initial febrile attack the gastro-intestinal symptoms were sometimes confused with an alcoholic "hang-over"—an excusable mistake, as the symptoms are almost identical. Many of these cases, before the appearance of jaundice, were also labelled "gastritis" or "dyspepsia."

The main diagnostic aid in the pre-icteric stage, however, is the presence of bile pigment and bile salts in the urine. Excess urobilinogen is also found at this stage, but its presence must be interpreted with caution, since it occurs in excess in the urine in malaria, and indeed when pyrexia is high from any cause. Excess urobilinogen in the urine of afebrile cases is of much more diagnostic value. Confirmatory evidence of subclinical icterus may be obtained by removing a sample of whole blood in a dry syringe and estimating the icteric index or serum bilirubin.

The histamine intradermal test described by Brodribb and Cullinan (1936) as diagnostic for subclinical icterus was carried out in a number of cases, but gave disappointing results. The test was rarely positive before the appearance of bile pigment in the urine.

Other Symptoms

Itching was not a usual complaint, and was recorded in only 9 cases. Occurring usually but not invariably at the height of the jaundice, itching was for the most part generalized, and was sometimes severe enough to prevent sleep. Apart from an accompanying persistence of anorexia and nausea in 3 cases, itching could not be associated with any particular symptom or sign, nor did it bear any relation to the severity or duration of the jaundice.

Urticaria occurred in 5 cases, none of which gave any previous allergic history. In one case it appeared on the sixth day of jaundice, but in the others it was noted late in the disease when the jaundice was decreasing. Slight epistaxis occurred in a few cases.

Relapses and Complications

When jaundice had almost or totally disappeared, there occurred in 5 cases a sudden relapse with deepening of jaundice, lasting on the average six to seven days. In one case the relapse, which appeared to have been brought on by a severe cold in the head, lasted three weeks. No satisfactory explanation for these relapses can be offered. They occurred in the more severe cases.

Death from acute necrosis of the liver is fortunately a rare occurrence, and there were no such cases in this series. Some of the more severe cases suffered from a considerable amount of debility, but otherwise there were no complications.

Liver Function Tests

Hippuric acid liver function tests by the oral method were carried out in a number of cases at various stages of the disease. This test, devised by Quick (1936), is a measure of the power of the liver to convert benzoic acid to hippuric acid, and is considered to be an index of the "detoxifying" power of the organ.

Briefly, it is carried out by giving orally 6 g. of sodium benzoate in the early morning and collecting for four hours complete hourly specimens of urine. The hourly excretion of hippuric acid is remarkably constant in the normal adult, who will excrete about 3 g. of sodium benzoate (in the form of hippuric acid) in four hours. Three grammes is chosen as the average normal for calculating the output in terms of percentage of normal. Excretion of over 90% of this amount is regarded as non-pathological (Quick, 1940).

Attempts to correlate the oral hippuric acid test with the bromsulphalein and galactose tolerance tests have been made by Snell and Plunkett (1936), and their results indicate that the oral hippuric acid test is reasonably accurate and satisfactory. Mateer and his co-workers (1942, 1943) have made a comparative evaluation of the newer liver function tests and are of the same opinion, though they found that the intravenous hippuric acid test was more sensitive than the oral method.

Quick's original technique was followed. The modifications of the test introduced by Weichselbaum and Probst (1939), Probst and Londe (1940), and others were not adopted. In the present series oral hippuric acid tests were carried out in the main at three stages of the disease: (a) when jaundice was at about its height; (b) when jaundice had almost disappeared; and (c) after two to four weeks' convalescence, when jaundice had totally disappeared. Many results were confirmed by a repetition of the test. During the first three weeks of jaundice tests were performed in 14 cases of all grades of severity, the duration of icterus varying from 7 to 81 days. Evidence of impaired function of the liver of from 37 to 72% of normal was found in all cases. Similar results have been recorded by Quick (1936), Probst and Londe (1940), and Henderson and Splatt (1942).

In an attempt to compare the function of the liver in mild, average, and severe cases, a number of tests were performed at the stage of the disease when jaundice had practically disappeared. All these patients were "up-patients" on ordinary diet, and jaundice had just disappeared from the skin and only a trace remained in the sclerotics. The icteric index ranged from 8 to 20. It is at this stage of the disease that patients are usually discharged from hospital, and it was considered desirable to obtain, in addition, some information as regards liver function at this time. That the liver was slow in regaining normal function in some cases was suspected on clinical grounds. We have seen in this hospital recurrence of jaundice in four patients (not included in this series) who had indulged rather too freely in alcohol during convalescence. It was thought that in these cases, although jaundice had practically or totally disappeared on discharge from hospital, liver insufficiency was still present, and the imbibing of alcohol had caused further liver damage, resulting in the reappearance of jaundice.

Hippuric acid tests performed in 29 cases when jaundice had almost disappeared revealed evidence of liver insufficiency in the majority. The results (Table III) show that in 19 cases (65%) the excretion of benzoic acid was less than 90% of normal, indicating an insufficiency of the "detoxifying" power of the liver. It will be observed that the type of onset, the duration of jaundice, and the presence or absence of hepatomegaly do not bear any constant relation to the function of the liver (as estimated by the hippuric acid test) when jaundice has almost disappeared. Indeed, fairly severe liver insufficiency may be present in relatively mild cases of jaundice (Cases 25 and 39).

Ten of the more severe cases showing abnormal hippuric acid tests on discharge from hospital were readmitted after two to four

weeks' convalescence for the performance of further tests. Jaundice had totally disappeared, and all these patients stated that they felt well and fit for duty. Urines were negative for bile and excess urobilinogen, and in no case was the liver palpable.

Of these 10 cases 6 gave evidence of recovery of liver function, while in 4 cases the excretion of sodium benzoate was less than 90% of normal, indicating insufficiency (Table III). Of the 4 cases showing liver insufficiency after total disappearance of the jaundice, one (Case 2) had been deeply jaundiced and for at least two weeks had passed stools deficient in bile pigment. In Case 4 the liver was palpable for the first four weeks of the illness. In the initial stages Case 6 was acutely ill with persistent vomiting, which required the administration of saline and glucose intravenously. The remaining case (No. 13) was an apparently average one of 28 days' duration, the liver being palpable for only a few days at the beginning of the illness. Cases with a clinical picture similar to these, however (Cases 1, 3, and 5), had normal hippuric acid tests. Thus it is not possible to detect, on clinical grounds, cases which will show insufficiency of liver function (as measured by the hippuric acid test) after the disappearance of jaundice. Whether complete recovery of the detoxifying power of the liver eventually occurred in these cases is not known, as it was not possible to follow them further.

TABLE III.—*Hippuric Acid Test*

Case No.	Duration of Jaundice (days)	Jaundice Disappeared from Skin; Present in Sclerotics (% of normal)	After 2-4 Weeks' Convalescence Jaundice Totally Disappeared (% of normal)	Liver	Remarks
1	81 NF	104% (9)	—	+ for 2 wks.	Severe case, with vomiting ++
2	55 F	67% (15)	77% (7)	0	
3	52 NF	61% (20)	103% (12)	+ for 6 wks.	
4	52 F	60% (17)	89% (7)	+ for 4 wks.	
5	50 NF	115% (10)	—	+ for 2 wks.	
6	45 F	73% (13)	73% (8)	0	Severe case, with vomiting ++
7	45 NF	51% (10)	90% (5)	+ for 6 wks.	
8	45 NF	89% (15)	—	+ for 1 wk.	
9	35 NF	74% (20)	98% (6)	0	
10	33 F	112% (8)	—	0	
11	32 NF	101% (17)	—	+ for 1 wk.	
12	28 F	78% (10)	95% (10)	0	
13	28 F	66% (17)	65% (7)	+ few days	Average case
14	28 F	71% (18)	110% (10)	0	
15	28 F	117% (12)	—	0	
16	28 NF	84% (9)	—	0	
17	26 F	52% (12)	—	0	
18	23 NF	96% (11)	—	+ few days	
19	22 F	99% (11)	—	0	
20	20 F	110% (15)	—	0	
21	20 F	66% (15)	104% (5)	0	
22	20 NF	77% (12)	—	0	
23	20 NF	86% (8)	—	+ for 2 wks.	
24	18 NF	64% (17)	—	+ for 1 wk.	
25	15 F	51% (16)	—	0	
26	14 F	85% (10)	—	+ few days	
27	14 NF	101% (18)	—	+ few days	
28	11 NF	97% (8)	—	0	
29	3 NF	52% (8)	—	0	

Figures in parenthesis = Icteric index.
F = Febrile type of onset.
NF = Non-febrile type of onset.

Second Attacks

There are few references to second attacks of infective hepatitis. Findlay, Dunlop, and Brown (1931) have recorded a case in which jaundice recurred two months after the primary attack, and Bates (1936) described the case of a boy aged 8½ years who had a recurrence of jaundice, more severe than in the first attack, 34 days after biliuria had disappeared. A similar recurrence three months after the first attack in a female aged 35 years was noted by Newman (1942).

TABLE IV

Case No.	Intervals between Previous and Present Attacks (years)	Duration of Present Attack	Hippuric Acid Test when Jaundice almost Disappeared (Present in Eyes Only) (% of normal)
1	1	16 days	—
2	8	8 "	—
3	14	7 "	72%; later 84%
4	8 and 13	66 "	64%; later 86%
5	10	20 "	110%
6	15, 11, and 1	3 "	91%

In the present series 6 patients gave a history of one or more attacks of jaundice, which had occurred at least a year previously. These attacks had lasted from three to six weeks,

and the descriptions of them resembled average attacks of infective hepatitis.

It will be seen from Table IV that the subsequent attacks were, on the average, no more severe than an ordinary attack of the disease. Nor can it be said that there was evidence of much residual liver insufficiency. Hepatomegaly was not a feature in these cases, the liver being palpable in only 2 instances. Hippuric acid liver function tests carried out when jaundice had almost disappeared showed that there was little or no disturbance of the detoxifying power of the liver. Of the 4 cases tested, 2 showed normal liver function and 2 only slight impairment (84% and 86% of normal). In actual fact, at this stage in the disease there is no more disturbance of the detoxifying power of the liver in these cases than in cases which do not give a history of a previous attack. Unfortunately, it was not possible to perform further tests on these patients.

It will be appreciated that only one single function of the liver has been tested in this series of cases, and it is probable that had other liver function tests been employed different results would have been obtained. Evidence of liver damage many years after recovery from the disease has been discovered when other tests for liver function have been employed. Using the bilirubin excretion test, Soffer and Paulson (1934) found evidence of liver insufficiency in 9 out of 11 patients who had had catarrhal jaundice. In 6 of the 9 cases the attack had occurred 3 to 18 years previously. The degree of retention of injected pigment varied from 10.7 to 50%, and they remark that the severity of the attack bears no relation to the degree of residual hepatic involvement. Likewise, Bergmann (1932) found that many years after infective hepatitis there was evidence of liver insufficiency, as shown by the bilirubin and galactose tolerance tests.

Notes on Aetiology

During the war of 1914-18 so-called catarrhal jaundice occurred in epidemic form in the Middle East theatre of war. Much literature appeared on the aetiology of the disease, and the general opinion at that time was well summarized by Willcox (1919), who held the view that "epidemic catarrhal jaundice is due to an intestinal infection causing duodenitis and catarrh of the bile ducts. The area round the ampulla may be mainly affected, and in some cases there may be produced an ascending catarrh causing cholangitis. In either case obstructive jaundice may result."

During the last 20 years this type of epidemic non-spirochaetal jaundice, which is of world-wide distribution, has been extensively studied, and the view that jaundice is caused by local inflammation and obstruction has fallen into disfavour. A great deal of evidence now exists to show that icterus is caused by a hepatitis, the essential lesion being degeneration of the parenchymatous cells of the liver. The post-mortem evidence is well reviewed by Cullinan (1939) and Findlay (1940), and in the aspiration biopsy experiments of Roholm and Iversen (1939) diffuse hepatitis was demonstrated in all cases.

Hurst and Simpson (1934), Hurst (1940), and Barber (1937) recognize two different types, which they maintain can be differentiated on clinical grounds: (1) a primary hepatic necrosis (or infective hepatitis); and (2) true catarrhal jaundice, which depends on obstruction to the flow of bile caused by catarrh of the duodenum and lower extremity of the common bile duct. Findlay (1940) also recognizes these two types, but is of the opinion that there are no symptoms by which true catarrhal jaundice can be differentiated from infective hepatitis.

In the present series there occurred cases the clinical pictures of which were almost identical with Hurst and Simpson's clinical description of primary hepatic necrosis on the one hand and of true catarrhal jaundice on the other. The existence in the same epidemic of two clinical types each with an entirely different aetiology is unlikely. Furthermore, liver insufficiency as measured by the hippuric acid test was present in both clinical types. Cullinan (1939), in a review of 23 outbreaks in England, also considers that there is not enough evidence to justify the above subdivision.

Treatment

Routine treatment consisted of a low fat and high carbohydrate diet, glucose twice or thrice daily, and a small dose of magnesium sulphate in the early morning. When the skin became free from icterus, patients were allowed up and were put on ordinary diet. When vomiting was frequent, excellent results followed the administration, by intravenous drip transfusion, of a few pints of normal saline with 5% glucose. Nausea and abdominal discomfort, persisting during the icteric stage, were sometimes troublesome symptoms. Some degree of relief was obtained by the use of sodium taurocholate, 4 to 6 gr. in cachets. Alkaline powder was also useful. Calcium lactate is indicated in unusually prolonged cases. The majority of cases require a spell of convalescence: alcohol should be forbidden during this period.

Summary and Conclusions

A short clinical description of 168 cases of infective hepatitis is given. Two fairly distinct types of onset are recognized and described. It is emphasized that the subsequent clinical course is almost identical in the two types.

The average duration of icterus was 24 days; the icteric stage lasted from 15 to 35 days in just over two-thirds.

The liver was palpable in 50% of cases and the spleen in 10%. Gross hepatomegaly was associated with prolonged jaundice, and the larger the liver the longer was the duration of icterus.

The diagnosis in the pre-icteric stage is often difficult, and in many cases will remain uncertain until bile pigment appears in the urine.

Hippuric acid tests for liver function by the oral method were performed in 14 cases when icterus was at about its height during the first three weeks of jaundice. Evidence of impaired function was found in all cases.

Recovery of liver function (as measured by the hippuric acid test) appears to be slow in some cases. In the convalescent stage of the illness, when icterus had just disappeared from the skin but remained in the sclerotics, evidence of liver insufficiency was demonstrated in 19 (65%) of the 29 cases tested. Impairment of liver function in the convalescent stage occurred in mild, average, and severe cases, and bore no constant relation to the presence or absence of hepatomegaly.

Evidence of liver insufficiency after total disappearance of jaundice was demonstrated in 4 cases.

Six cases with a history of one or more previous attacks of the disease are mentioned. Second attacks appear to be no worse than the first. The results of hippuric acid tests performed in 4 cases showed little or no evidence of residual liver insufficiency.

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P. Freud, G. D. Rook, and S. Gurian (*Amer. J. Dis. Child.*, 1942, **64**, 895), who report a case in a female infant aged 3 days, state that there are only five cases on record of herpes zoster in the newborn. Trauma and toxins could be excluded, so that an infectious origin was very probable. As in the other cases of herpes zoster in infants, evidence of pain and discomfort was absent. Complete healing took place in six weeks and there was no scarring.

THE SIGNIFICANCE OF BLOOD-PRESSURE READINGS IN GENERAL SURGICAL WORK WITH SPECIAL REFERENCE TO THE CARDIAC INDEX

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Blood-pressure readings have been made before, during, and after general surgical operations in my practice since 1932. They have proved to be valuable and instructive. They were started with the need to detect and counteract the marked falls of blood pressure that occurred during spinal anaesthesia, and were used in the search for further aids in the detection of poor surgical risks with a view to excluding the necessity for the explanation "the operation was successful, but unfortunately the patient died" (Dodd, 1940). This note attempts to assess the significance of blood-pressure readings in general surgical work in the light of this experience.

Before Operations

The Cardiac Index.—It was from Mr. Ernest Miles that the significance of the Moot-McKesson cardiac index was learned. This estimation is more widely known than formerly, but it is seldom taught, and, because of this, when it is mentioned it meets with some scepticism. The cardiac index is estimated as follows:

The normal systolic blood pressure is 120 mm. Hg and diastolic 80 mm. Hg, the difference—the pulse pressure—being 40 mm. The cardiac index is reckoned by working out the percentage fraction which results by placing the pulse pressure as numerator over the diastolic pressure as denominator. Ordinarily the pulse pressure is 40 and the diastolic pressure 80, giving a fraction of $\frac{40}{80} = 50\%$.

The Significance of the Cardiac Index.—Clinical experience has shown that patients with a cardiac index between 33 and 80% are fair surgical risks, between 80 and 100% and between 25 and 33% they are doubtful and poor operative risks, while above 100 and below 25% no surgical procedure is safe: Miles said that opening a whitlow in such a patient is likely to prove fatal. This cardiac index has proved of assistance in the selection of patients for operation, and also after operations, when the blood pressure has been measured and serious disturbances found. It indicates the need for measures to improve the tone and fill the cardiovascular system—necessities that might otherwise be overshadowed by the problem of surgical diagnosis and the operation. Clinical improvement almost invariably follows these remedies, especially in elderly people, in whom the blood pressure is often around 140/70, giving a cardiac index of 100%. Pre-operative rest in bed for one, two, or three weeks, with a fluid intake of 6 to 8 pints daily and cardiac tonics, approximates these figures to, say, 130/80, and major operations have then been undertaken with consistently uneventful convalescences.

The opinion at present held as a result of these studies is that the blood-pressure figures in themselves mean little: it is the relation of the diastolic and systolic which matters—i.e., the cardiac index; a high or a low systolic blood pressure between 100 and 200 mm. is immaterial to the surgeon considering a major operation so long as the cardiac index is around 50%. Actually, in a period of ten years, during which the blood pressure of all new surgical out-patients has been taken, a systolic pressure of over 180 or lower than 100 has been rare in adults.

Condition of Heart and Blood Vessels

The taking of the blood pressure, apart from yielding the systolic, diastolic, and cardiac index values, gives good data concerning the regularity or otherwise of the heart-beats and, by the strength of the beat, the quantity of the heart output. These features, when noted with the stethoscope over the artery at the elbow, arrest the observer's attention more certainly than the routine clinical examination of the heart and pulse. Considerable variations in regularity and size of the pulse are detected, and the systolic and diastolic readings also sometimes