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PEPTIC ULCER AND DYSPEPSIA IN THE ARMY

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This communication is principally concerned with peptic ulcer, but some reference will be made to other forms of dyspepsia met with in the Army. For reasons of security statistics cannot always be given in a strictly comparable form. The types of dyspepsia occurring in the Service may be classified as follows (Tidy, 1941): (1) Peptic ulcer. (2) Gastritis and functional dyspepsia. (3) Transient dyspepsia. (4) Miscellaneous group, including such conditions as dyspepsia due to or associated with pathological changes in the gall-bladder and appendix, duodenal diverticula, and carcinoma of the stomach: the number in the Army has been very small.

Transient Dyspepsia

This type tends to develop in new recruits before they are hardened to Army routine: possibly it is less common now than earlier in the war. These men are in the main successfully dealt with in the units. It is most important that they should not be sent to hospitals or to specialists—procedures which are apt to convert a transient into a chronic dyspeptic, and finally into a useless soldier.

Gastritis and Functional Dyspepsia

No satisfactory or accepted nomenclature has been evolved for this group. "Gastritis" is now being used with a technical meaning by gastroscopists, and will probably need to be reserved for this. "Functional" tends to suggest psychoneurosis. This should not be the sole meaning of "functional dyspepsia," which refers to a disturbance of the functions in the absence of recognizable anatomical changes or demonstrable disease in the stomach and duodenum and elsewhere in the body.

Graham and Kerr in 1941 found a history of symptoms dating from civilian life in 80%, with an average duration of 7 years, most of the cases being collected in 1940. I am indebted to several officers for statistics of admissions in 1942, the averages being: age 32½, service 2½ years, duration of symptoms 5½ years, onset in civilian life 75%.

Careful studies have been made of this group in several hospitals without any definite result. Gastroscopy reveals a small proportion of organic gastritis. I do not feel satisfied at present that clinical syndromes can be connected with different types of gastritis so diagnosed, in spite of statements to this effect. It would appear that gastroscopy has not yet sufficiently established the limits of variation of a normal gastric mucous membrane or the interpretation and clinical significance of variations judged to be abnormal.

Radiological studies of the mucous membrane leave an unsatisfactory position. This applies especially to the diagnosis of "duodenitis," a term which is used with widely different meanings and interpretations by various observers. Arguments based on changes in the gastric mucous membrane are not valid for the duodenum, as is illustrated by the absence of neoplastic changes in the latter. That some form of chronic duodenitis may exist can scarcely be doubted, but evidence of its nature and interpretation and clinical significance is absent. Duodenitis at present is a radiographical conception without clinical, surgical, or pathological support, and without agreement among radiologists. Dogmatic diagnoses and conclusions are unjustified on present evidence and should not be unreservedly accepted. The diagnosis duodenitis would appear to be used by some radiologists in conditions in which they are uncertain whether or not ulceration has occurred.

Of these cases of "functional dyspepsia" some are organic in the sense of disturbance of function, some are essentially psychoneurotic, and some others are made so.

Symptoms in this group are far more resistant to treatment than are those of ulcers, and cases need much longer in hospital for "cure" or alleviation; the longer the period in hospital the shorter is the interval to the next recurrence. There should be no attempt to retain a man in hospital in order to effect a "cure" which wide experience has shown is quickly followed by relapse on returning to duty. As soon as investigations have proved the absence of organic changes, which should be within 10 days, these men should be returned to their units. Nor should they be placed on "light duty" or "light diet." The unit is the proper authority to decide by observation if a man can be usefully retained in his unit or in his category.

Under Service conditions, and probably also in civilian life, prolonged investigations and minute inquiries tend to produce or increase a psychoneurotic factor, and a man rapidly progresses to the state of being useless as a soldier. A hospital consequently should reduce its investigations to a minimum and not aim at a standard full investigation. Gastroscopy should be restricted to those circumstances in which it has already proved its value in civilian life—e.g., for the decision as to the presence of a neoplasm or the presence of an ulcer radiologically doubtful. In the Services it should not be used for the identification and classification of gastritis. Nevertheless once a man is sent to hospital some investigation, clinical or otherwise, is inevitable. It is therefore advisable that this type should not be sent for either in-patient or out-patient investigation, or for report by a medical specialist, without definite reasons. The least of these procedures will magnify the disorder and their repetition render it incurable.

The M.O. of the unit thus has a special responsibility in keeping these men on duty, to which many become inured and are thus saved for the Service. His examination should be of the same degree and not more minute than for comparative complaints in other systems of the body. Unless he sends a large number to hospital he runs the risk of missing occasionally an active ulcer, with resulting misfortunes; and if he is to take the responsibility in the interest of the Services he should know that the possibility of an occasional mistake is fully understood. In practice, catastrophes are rare, and they may also occur after the fullest examination in this as in other conditions.

There is little doubt that this type of dyspepsia has increased rapidly in civilian life in recent years, and is not inconsistent with routine employment with occasional absences. The question of its relation to the increase of peptic ulcer has scarcely

been considered. Like peptic ulcer, it was not prevalent in the last war among British troops.

Relative Incidence of Peptic Ulcer and Non-Ulcer Dyspepsia among Army Personnel

The distribution of dyspepsia between the chief groups among Army personnel may vary considerably in different hospitals, partly depending on the type of unit in the neighbourhood and the opinions and experience of medical officers. The following figures are official returns of diagnoses of Army personnel on discharge from all hospitals in Britain for a certain period in the latter half of 1941. For comparison the discharges from the Army for the same period are also included. These figures give 58% of admissions as ulcers. Newman and Payne found nearly 90% of ulcers early in 1940, but the material had largely been sifted of non-ulcer dyspepsia in France. Of 2,500 hospital cases which I analysed (Tidy, 1941), ulcers formed 52%.

	Total Cases	Gastric Ulcer	Duodenal Ulcer	Non-Ulcer Dyspepsia
		Cases	Cases	Cases
Discharged from hospital ..	2,851	453 (16%)	1,194 (42%)	1,204 (42%)
Discharged from the Army ..	2,149	460	1,620	69

Discharges from the Army for non-ulcer dyspepsia are negligible compared with the number in hospital, and this supports the opinion that such men can make useful soldiers in spite of their handicap. No physician would suggest as an explanation of the small number of discharges from the Army for non-ulcer dyspepsia that the hospital treatment effected a complete cure. It has, however, occurred that such men, though useless and a handicap to a unit, are retained in the Service owing to the disinclination of medical boards to discharge men under this diagnosis, and that discharge ultimately is effected after reference to a psychiatrist has resulted in a diagnosis of psychoneurosis.

Some subjects of non-ulcer dyspepsia are unfit for medical service on account of their disability: the decision should be best made by those who have had the advantage of prolonged observation. Medical boards have to meet the difficulty in a practical manner without too many rules to help or hamper them, for it is certain that a loose acceptance of the diagnosis of non-ulcer dyspepsia as an invaliding disability is inadvisable.

Peptic Ulcer in the Army

The large number of admissions to hospital of men diagnosed as suffering from peptic ulcer and from non-organic dyspepsia attracted attention as early as Oct., 1939, and took the medical profession by surprise. The different circumstances which led to admission to hospital in Service and civilian life were not at first understood; but, even allowing for this, the medical profession had not recognized the extent to which dyspepsia had increased among males during the last 20 years, and believed that the influx was purely a Service development.

Two suggestions early and repeatedly made were, first, that the cases diagnosed as peptic ulcer were not in fact ulcers; and, secondly, that the prevalence of dyspepsia was due to poor cooking in the Army. Newman and Payne (1940), working under a grant from the Royal College of Physicians, established two facts: first, that the cases so diagnosed were in general definitely ulcers; and, secondly, that nearly 90% of the cases, both ulcer and non-ulcer, had a long history of similar symptoms in civilian life. They were of the opinion that Army cooking, and especially the greasiness of the food, was a factor in causing the early breakdown and recurrence of symptoms in the Army. A large proportion of the Army at that period consisted of reservists, many of whom had been several years in civilian life, and it was anticipated that as these were weeded out the incidence of dyspepsia would fall, especially if Army cooking improved. Events have disproved these anticipations. Army cooking had many difficulties to face in early days, but it has long since been of a satisfactory standard, and the number of reservists has fallen to a small fraction of the present Army. Nevertheless, the flow of both ulcer and non-ulcer dyspepsia continued.

In the last war neither peptic ulcer nor dyspepsia of other types formed a problem of any magnitude, and indeed the rarity of peptic ulcer was definitely noted and duodenal ulcer is not even mentioned in the *Medical History of the War*. So far as Army diet and cooking are concerned, there is no reason to suppose that they were better than in the present war. The relative incidence in the two wars can be judged by the following figures. In the last war up to the end of 1915 (*Medical History of the War*, 1931) the discharges from the Army for "inflammation and ulceration of the stomach" were 709. In the present war the number discharged for peptic ulcer to Dec., 1941, was 23,574.

In order to obtain a picture of the present position of peptic ulcer in the Army 800 Army medical cards (A.F.I. 1220) have been analysed; they were taken at random from the first four months of 1942 (Table I). These come from all parts of Britain, but not from over-seas.

TABLE I.—*Analysis of 800 Army Medical Cards of Peptic Ulcer (Random Selection from Military Hospitals in Britain; Early 1942)*

Onset of Symptoms	Total				Under 40 Years				Average Age		Duration of Symptoms	
	Cases	Simple	Haemorrhage	Perforation	Cases	Simple	Haemorrhage	Perforation				
									Yrs.	Mths.	Yrs.	Mths.
Gastric ulcer:												
Civilian ..	105	98	3	4	92	85	3	4	32	7	7	4
Service ..	39	24	4	11	33	20	4	9	31	5	–	7
Total ..	144	122	7	15	125	105	7	13	32	0	5	6
Duodenal ulcer:												
Civilian ..	543	519	14	10	472	451	14	7	32	2	6	6
Service ..	113	96	5	12	100	85	5	10	30	6	1	
Total ..	656	615	19	22	572	536	19	17	31	11	5	7
Total peptic ulcer:												
Civilian ..	648	617	17	14	564	536	17	11				
Service ..	152	120	9	23	133	105	9	19				
Total ..	800	737	26	37	697	641	26	30				

Onset in Civilian Life and in the Army.—In 81% symptoms began in civilian life. In 19% symptoms began in the Army after the outbreak of war, the average length of war service in this group being two years, the age 30 years 9 months, and the duration of symptoms 9 months. These records for the Army and the records for St. Thomas's Hospital 1933-6 have both been analysed for men under 40 years of age to ascertain in what proportion the duration of symptoms was less than 3 years, corresponding roughly to the maximum of war service. For the Army the proportion was 26% and for St. Thomas's 35% (Army, 148 out of 553; S.T.H., 49 out of 140). These records are not contemporary, but, so far as the figures are of value, they are against any undue development of peptic ulcer during war service. Unfortunately there are no data on which one may decide if the Army incidence is higher or lower than would develop in civilian life as distinct from hospital admissions in the same age group and in the same length of time. For gastric ulcer the onset in civilian life is 73%, the previous duration of symptoms 5 years 6 months, and the average age on admission 32 years. For duodenal ulcer the onset in civilian life is 82%, the previous duration of symptoms 5 years 7 months, and the average age on admission 31 years 11 months.

Site of Gastric Ulcer.—Of 118 cases (omitting admissions for perforation and haemorrhage) the ulcer was on the lesser curvature in 90 with a previous duration of symptoms of 6 years 1 month and age on admission of 32⅔ years, and at the pylorus in 28 with a previous duration of 5⅔ years and age of 29⅔. It is possible that pyloric ulcers early tend to produce symptoms.

The main supply of peptic ulcer in the Army is still the recurrence of symptoms which started in civilian life. The position is similar for non-ulcer dyspepsia.

Relative Incidence of Gastric and Duodenal Ulcer

The following data bear on their relative incidence in the Army:

	G.U.	D.U.	Ratio D.U. to G.U.
1. Discharges from the Army for peptic ulcer for a considerable period in later months in 1941	1,088	4,000	3·6 : 1
2. Discharges of men from hospitals over a period in 1941	453	1,194	2·6 : 1
3. Discharges from the Army during the same period as No. 2	460	1,620	3·5 : 1
4. Discharges of men from hospitals over a partly different period	1,176	2,431	2·1 : 1
5. Analysis of 800 A.F.I.1220 diagnoses on discharge from hospitals (early 1942)	144	656	4·6 : 1
6. Analysis of 2,500 discharges for all forms of dyspepsia from a few selected hospitals (1940) (Tidy, 1941)	230	812	3·5 : 1

Nos. 1, 2, 3, and 4 are from official returns of the Army Medical Statistical Department. No. 5 is from my analysis of 800 medical cards taken at random and supplied by the Statistical Department. No. 6 is from returns of a number of hospitals which I collected for the discussion at the Royal Society of Medicine. There is a definite discrepancy in the ratios of these data. Of the 800 cases analysed for No. 5, the ratio of gastric to duodenal ulcer was 1 to 5.2 with onset in civilian life and 1 to 2.9 with onset in the Army (Table I)—that is, with the shorter duration of symptoms—and the ratio thus will vary with the relative proportion of the two groups. The proportion of duodenal ulcer was higher between 20 and 30 than between 30 and 40 years, the ratios for a series being: between 20 and 30 years 1 to 5.7, between 30 and 40 years 1 to 4.6, and over 40 years 1 to 4.3. The proportion of duodenal ulcer was also higher when the previous duration was over 3 years than when it was under 3 years, the respective ratios being 1 to 5.4 and 1 to 4. During the same period as No. 2 the discharges from the Army were gastric ulcer 460 and duodenal ulcer 1,620, a ratio of 1 to 3.5, and the numbers previous to and following this period are similar.

It is possible that the discrepancy between Nos. 2 and 3 is partly due to diagnoses made by radiography on men seen as out-patients at hospitals. This would suggest that the diagnosis of duodenal ulcer is readily made on out-patients but not the diagnosis of gastric ulcer, which is certainly more difficult. It is not easy to supply a satisfactory explanation.

The figures given for discharges from the Army (No. 1) are probably the best guide to the general relative incidence, as the numbers are large, include the whole Army at home, and are the most carefully authenticated. Discharges of officers alone give the same ratio—viz., 3.7 to 1. The Army is partly a selected personnel in relation to peptic ulcer, since many cases are rejected by the medical boards.

Liability to Relapses and Recurrences from Peptic Ulcer in the Army

When the question of peptic ulcer in the Army originally came under consideration the opinions were often expressed, first, that ulcers formed rapidly in the Army, and, secondly, that relapses and recurrences were more frequent than in civilian life. It has already been shown that the evidence is against the first statement. With regard to relapses and recurrences, it must be borne in mind that a man in the Army with peptic ulcer who develops even mild symptoms will almost inevitably reach hospital. Admissions to hospital in the Army which count as recurrences are paralleled in civilian life by periods off duty for sickness in a large industrial concern rather than by admissions to hospital. The study of peptic ulcer among employees of the Post Office by Bashford and Scott (1935) showed the frequency of such absences even at a period when peptic ulcer was less common than nowadays.

It is probable that a man with peptic ulcer in the Services is most affected not by irregularity of the times of the principal meals, or even, within limits, by the diet, but by difficulty in obtaining food at short intervals and directly he feels that he requires it. I believe that an additional factor is that physical fitness and healthy exercise engender a large appetite. One hears from a man who knew that he had had an ulcer, and was anxious to carry on in spite of some recurrence of symptoms, that he would eat an amount at dinner which he would not think of taking in civilian life, and cover it with a liberal supply of sauce. This explains the frequency of vomiting, often at the end or, distressingly, even before the end of dinner.

Relapses in the Army will probably occur more readily than in many civilian occupations, but the incidence in the Army as compared with civilian life cannot be measured by admissions to hospital or the number of discharges from the Service. A modern investigation on the lines of Bashford and Scott's (1935) study of Post Office employees would possibly afford the best guide to the relative frequency of recurrence in the Army and civilian life.

Disposal of Cases of Peptic Ulcer

The policy of the Army is to invalid from the Service all men with the accepted diagnosis of peptic ulcer, with exceptions in the case of key men. In the early period of the war certain hospitals returned cases to ordinary duty after treatment, and this consistently proved unsuccessful. The number of cases is so large that many suggestions have been made for retaining men in the Service in some suitable role, varying from special "ulcer battalions" to "light duty"—a form of duty which, when prolonged, results usually in a negligible output. It is the experience of industry that subjects of peptic ulcer are frequently absent for sickness even when the inducement is to remain at work and the occupation allows some latitude in routine.

The Army would need to arrange not only special diet for an ulcer unit but also a special routine for times of meals—more difficult, and in my opinion equally important—and the unit would need to be undisturbed by a high rate of sickness. For if a man with an accepted ulcer reported sick with a statement of recurrence of symptoms the M.O. could rarely avoid sending him off duty. No existing unit or category in the Army meets these requirements on a large scale, and it may be doubted if any formation would pay a dividend, but conditions may be different in other Services.

Accurate diagnosis is important, for a diagnosis of peptic ulcer, once accepted, is permanent. The diagnosis nowadays rests too largely on the opinion of radiologists, not all of whom have had enough experience of the alimentary canal; and, further, a doubtful radiological opinion is not infrequently accepted as conclusive by a physician who is himself doubtful on clinical grounds. I believe that at times cases which are at least doubtful both radiologically and clinically are being given the definite diagnosis of peptic ulcer.

The position must not be regarded too strictly from the point of view of a gastric specialist. The essential duty of a medical board is to decide if a man will make a "useful soldier" in any category, and the Board must in general be guided by the reports before it. It can decide more easily when the diagnosis is within the covers of the officially accepted *Nomenclature of Diseases* of the Royal College of Physicians, which was designed for a different purpose, but it hesitates to discharge a man for "chronic dyspepsia, no organic changes" or "query peptic ulcer." The medical officer who is satisfied that such a man is useless as a soldier inclines towards a definite diagnosis of "peptic ulcer" or, with the necessary assistance of a psychiatrist, "psychoneurosis." I do not believe that the Army is thus losing many useful men because of gastric disabilities, though a certain number are spoilt by excessive investigation, attention, and treatment in hospitals. The position with regard to statistics is more intricate, and the figures for duodenal ulcer and for gastric neurosis should be accepted with some caution.

Incidence of Complications

The rarity of complications of peptic ulcer in the Army has aroused comment. It is a question if this is not more apparent than real. There are several factors which can make for an apparent rarity. First, the large number of admissions of ulcer cases for slight disturbances reduces the proportion of complications and gives an appearance of rarity. Such admissions occur especially among old-standing cases, and the returns from St. Thomas's Hospital show that complications are less frequent when the previous history is over three years than in recent cases. Secondly, 86% of Army admissions are under 40 years of age, an age group in which deaths from complications are rare.

Figures of complications for St. Thomas's Hospital and the Army are placed together in Table II. Perforations compared

TABLE II.—*Frequency of Complications (Under 40 Years)*

Onset of Symptoms	Total Cases	Perforations		Haemorrhages		Deaths
		Cases	%	Cases	%	
Army: From 800 Army Medical Ca ds of Peptic Ulcer						
Before joining	564	11	2	17	3	1 (haemorrhage)
After ioining	133	19	14	9	7	2 (perforation)
Total ..	697	30	4	26	4	3
St. Thomas's Hospital: 1933-6. Males						
Over 3 years	104	18	17	7	7	2 (perforation)
Under 3 years	104	29	28	12	12	2 ,,
Total ..	208	47	23	19	9	4

with cases admitted are 23% for St. Thomas's and 4% for the Army. The difference may depend partly on the standard for admission of cases, which will affect the percentages, and partly on selection by the recruiting boards, since the difference in incidence is most pronounced in cases with a short history. In comparison with perforations, haemorrhages are higher in the Army than for St. Thomas's Hospital, but in the latter an admission is recorded as haemorrhage only when this is of considerable severity, and the same standard is not necessarily employed in Army diagnosis. It is clear that these two sets of figures are not comparable.

It is not impossible that the Army figures give the more correct picture of the incidence of perforation among peptic ulcer in this age-and-sex group of the population than the records of admissions to St. Thomas's, even though a number of cases of established ulcer have previously been eliminated by the medical examining boards.

Perforation of an ulcer, as is well known, may take place without previous symptoms, but in reading through the notes of cases at St. Thomas's Hospital one is struck by the number of instances in which there is a history of severe gastric symptoms for a few days or a week or so preceding the catastrophe and shock of perforation, either as a new development or with a previous history of ulcer or dyspepsia. In the Army, men would be in hospital before the intervening period elapsed, and perforation may thus be saved in a certain number of cases.

Deaths from Perforation.—The analyses of perforations at St. Thomas's Hospital have shown that the case mortality for perforations varies greatly with the age, especially for gastric ulcer. For gastric ulcer the case mortality over and under 40 years is respectively 35% and 5%, and for duodenal ulcer 19% and 14%. In the series of 800 Army medical cards there were 13 perforations with no deaths ascribed to gastric ulcer among 125 admissions under 40 years, and 17 perforations with two deaths ascribed to duodenal ulcer among 572 admissions.

Haemorrhage.—From the 800 Army medical cards, 26 men appear to have been admitted specifically for haemorrhage, with one death. All were under 40 years. Without wishing to stress the fact, it may be mentioned that the death occurred in the only instance in which operation was undertaken for the direct purpose of checking haemorrhage. The bleeding-point was found and successfully ligatured, and the operation satisfactorily concluded, but the patient died from pulmonary thrombosis.

It is probable that the incidence of perforation and haemorrhage in peptic ulcer in the Army is about the same as in a similar group of a civilian population, perhaps with some reduction owing to earlier admission to hospital. It is possible to make a rough comparison of deaths from perforation in the Army and in the civil population from the following data:

1. Registrar-General's Returns of Deaths. In 1938 the death rate per million living from peptic ulcer of males between ages 20 and 39 years was 22.

2. St. Thomas's Hospital statistics ascribe 50% of deaths in hospital in this group to perforation.

3. For the Army, data exist for the ration strength, the proportion under 40 years of age, the number of discharges from hospital for peptic ulcer in a year, and the deaths from perforation in a random sample.

The data from the Army cannot be given, and the number of deaths from perforation is too small to be reliable, but the figures available suggest that deaths from perforation in the Forces are about 75% of the expected number. This figure cannot be considered as more than an approximation, but for what it is worth it suggests that rarity of perforation is more apparent than real.

Other Complications, etc.—Among 144 cases of gastric ulcer there were 2 cases of previous perforation and 2 in which gastrectomy had been performed. Among 656 cases of duodenal ulcers there were 30 cases of previous perforation and 13 in which gastro-enterostomy had been performed. Two cases were admitted with pyloric obstruction and 4 with duodenal diverticula.

Dyspepsia among A.T.S. Personnel

The number of cases of dyspepsia, organic and non-organic, among A.T.S. personnel has been so small that no elaborate analysis would be of value. The comparative incidence of dyspepsia among males and females in the Army can be calculated as follows: the equivalent annual ratio per thousand is calculated from the number of hospital admissions and the ration strength separately for the male personnel and A.T.S. personnel. The comparison of these two values, which cannot be recorded, gives a ratio of males to females of 4 to 1. The ratio of males to females under 40 years in admissions to St. Thomas's Hospital for the period 1933-6 was 5 to 1, the distribution of the population of London between the sexes being approximately equal. As the ratio of the sexes in this period was the same for gastric ulcer and duodenal ulcer the ratios in other areas are less likely to vary greatly from this figure.

The close agreement between the ratios for St. Thomas's and for the Army indicates that the incidence in the two sexes is the same in the Army as in civilian life. For non-organic dyspepsia the ratio of male to female in the Army on the same basis is 2.2 to 1.

Summary and Conclusions

The incidence of dyspepsia of all types in the war of 1914-18 was low.

The prevalence of dyspepsia, organic and non-organic, in the Army in the present war is a reflex of its incidence in the civilian population, which has greatly increased in the last 20 years.

There is no evidence of undue development of fresh cases of peptic ulcer in the Army.

Of admissions to hospital for peptic ulcer in 1942, the onset occurred in civilian life in 81%—73% for gastric ulcer and 82% for duodenal ulcer. Of admissions for non-peptic ulcer, the onset occurred in civilian life in 75%.

The number admitted to hospital for minor symptoms in the Army gives an exaggerated picture of the prevalence compared with civilians.

Symptoms due to pre-existing peptic ulcer tend to recur in the Army owing to unavoidable routine, and will do so under the best conditions of diet and cooking.

Of admissions to hospital for dyspepsia, peptic ulcer formed 58% and non-ulcer dyspepsia 42%.

The ratio gastric ulcer to duodenal ulcer varies in different series, but is probably about 1 to 3.6. The proportion of duodenal ulcer is higher in the age group 20-30 than in 30-40 years (which agrees with the results at St. Thomas's Hospital), and higher with a previous duration over 3 than under 3 years.

The average age of 656 cases of duodenal ulcer was 31 years 11 months, and previous duration of symptoms 5 years 7 months. Of 144 cases of gastric ulcer the age was 32 years and duration

5¼ years. Of 118 cases of gastric ulcer, 90 were on the lesser curvature, the age being 32⅔ years and duration 6 years 1 month; and 28 at the pylorus, the age being 29⅔ and duration 5⅔ years.

Men suffering from peptic ulcer are not suitable for Army life under present conditions.

Men suffering from non-organic dyspepsia can in many cases make useful soldiers provided they are not detained too long in hospital. Cure of symptoms should not be attempted. An excess of medical attention and investigation results in exaggeration of symptoms and repeated admission to hospital.

Complications are rare in the Army compared with the incidence among admissions of the same age-and-sex groups in civilian hospitals, but the rarity is more apparent than real. It is probable that the incidence in the Army is a truer reflex of the incidence in the population than is afforded by civilian hospital admissions.

The low mortality from perforation and haemorrhage is similar to that in civilian males under 40 years of age.

The comparative incidence of dyspepsia between the two sexes in the Army is similar to that among civilians.

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LEVELS OF VITAMIN A AND C NUTRITION IN GLOSSOP SCHOOL-CHILDREN AND EFFECT OF DEFICIENCIES ON THEIR PHYSICAL CONDITION

(PRELIMINARY COMMUNICATION)

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During the period Oct., 1941, to July, 1942 (37 weeks), the effects on the physical condition of feeding supplementary vitamin preparations to the school-children of Glossop had been investigated under a scheme devised by the Ministry of Health, and consequently we took the opportunity of using these same children in order to estimate the state of their vitamin A and C nutrition and the effects of any deficiencies on their physical condition. About 400 children, aged 9 to 14 years, were involved—200 having the vitamin capsules, and 200 not receiving supplementary vitamins acting as controls; the former group (hereafter called the "vitamin group") received daily doses of 4,000 I.U. of vitamin A, 350 I.U. of vitamin B complex, 1,000 I.U. of vitamin C, 600 I.U. of vitamin D, 2 mg. of riboflavin, and 20 mg. of nicotinamide five times weekly; the latter group (hereafter called the "control group") received capsules not containing any vitamins. The present report is a preliminary consideration of the period 1941-2.

I. LEVEL OF VITAMIN C IN GLOSSOP SCHOOL-CHILDREN

Methods Employed

(*a*) *The saturation test* employed follows the method of Harris and Abbasy (1937). Test doses of 11 mg. per kg. of body weight were given in the morning, and the urine was collected during the fifth and sixth hours, acidified, and titrated against dichlorphenolindophenol. The advantage of this method is its simplicity, especially if one is concerned with school-children, as in our case. Harris (1942) has dealt extensively with the criticisms of this method.

(*b*) *Estimation of the Vitamin in Blood.*—As a supplementary to the saturation test and as an essential to Part III of this paper, blood vitamin C estimations were regarded as necessary. The analysis was done on whole blood, following the method of v. Eekelen (1937) with the use of mercury acetate and hydrogen sulphide. Our findings are in agreement with those of Heinemann (1941), who discussed the value of this method fully. We do not consider it to be less informative than the method employed by Butler and Cushman (1940), who determined the ascorbic acid content of whole blood colorimetrically. In our opinion these methods are the most reliable indication of the vitamin C level in an individual. Measurable amounts of ascorbic acid are found in whole blood after the plasma level has become zero, and the fluctuation of the plasma values also influences considerably the reading in normal and saturated persons (Portnoy and Wilkinson, 1938). Analysis of the white-cell and platelet layer was carried out when severe deficiency was suspected, since the white-cell layer provides evidence of deficiency only and not of good nutrition. In the case of a deficiency, however, it has the advantage over whole-blood estimations that the results are independent of the plasma fluctuations, and the ascorbic acid appears to be retained longer in that layer than in other blood constituents. In following this routine, when sufficient blood was available, we estimated the content of the white-cell layer in cases of severe deficiency as indicated by a blood vitamin C estimation below 0.3 mg./100 ml.

(*c*) *Inquiry into the Dietary Intake.*—A comprehensive dietary survey covering a period of three weeks was made on the families whose children were concerned in this study. The parents kept an accurate daily record, on printed forms, of all the food used during this period, both purchased and grown in their own allotments. They were interviewed by us at the beginning and end of this period, so that the reports obtained may be regarded as reliable. We also estimated the amount of ascorbic acid and calculated the nutrients contained in the school meals during this time, thus obtaining a very detailed evidence of the dietary intake of the children. Under this heading our findings are given with regard to the vitamin C intake.

Procedure and Results

Since the combined investigations carried out on the school-children by the Ministry of Health and ourselves were of a very complex nature, and the tests were not allowed to interfere with each other, we had to choose what, in our opinion, were the most suitable methods available. Therefore, in Jan.-Feb., 1942 (three months after the beginning of the test period), all the 400 children were given two test doses of ascorbic acid and no more. This enabled us to assess the amount of non-saturation present at that time. The children in the vitamin group (200) had by then received 3,000 mg. each on an average. They were all found to be saturated, as indicated by an urinary excretion of 0.8 mg. or over per kg. of body weight.

The control group (200) showed non-saturation in 72% of cases (145). Half of this number (71; 35%) showed no increase whatsoever, whereas the remaining 37% (74) excreted 0.3 to 0.7 mg. per kg. during the test period. The tests were continued in June, 1942 (at the end of the test period), with the object of ascertaining the severity of the deficiency. We assumed that those who in January and February had responded to the test doses with either saturation or increased excretion were not likely to be severely deficient in June. We therefore continued the tests with only the 35% of the boys who had shown no increased excretion at all. Samples of their blood were examined, and they were given test doses until full saturation was achieved. Out of these 71 boys 58 were found to be in a very deficient state—i.e., 36 having a blood value below 0.3 mg./100 ml. and requiring 5 to 7 test doses before saturation was attained, the remaining 22 a value between 0.3 and 0.5 mg./100 ml. and requiring 4 to 6 test doses for saturation. There is admittedly a good chance that some of the remaining subjects who were not investigated in June had become deficient, but their deficiency is not likely to be as