Manifestation and Occurrence of Selective Adult-Type Lactose Malabsorption in Finnish Teenagers

A Follow-Up Study

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In 1969–1970, a simple random sample of 129 Finnish school-aged children was examined to study selective adult-type lactose malabsorption (SLM) in this age category. SLM was found in 8 children. All subjects were reexamined 5 years later. SLM was reconfirmed in these 8 persons and found in 3 additional subjects who had normal lactose absorption in the first examination. The prevalence of SLM was 9.3%, being 8.5% in the age category 12–15 years and 9.9% in that 16–20 years. Low rise of blood glucose in the lactose tolerance test of the first examination, very low milk consumption, milk intolerance, and history of gastrointestinal symptoms were found to be of low predictive value as indicators of SLM. It was also concluded that information about dietetic sources of lactose is important to persons with SLM, but categorical exclusion of lactose from the diet is not necessary, at least in the Finnish population.

Selective adult-type lactose malabsorption (SLM) caused by very low small-intestinal lactase activity appears during childhood or adolescence. There is strong evidence for the genetic etiology of SLM with the mode of inheritance indicating a single autosomal recessive gene (1-4). The prevalence of SLM is well documented for many adult populations (2, 5-7). Follow-up studies of persons with SLM are very few (8). Appraisals of the manifestation age of SLM have been based on prevalence studies.

In this study, a fixed cohort of 129 randomly selected Finnish teenagers were reexamined 5 years after the first examination. The purpose of the study was: 1) to collect follow-up data of SLM subjects and get verification of whether SLM remains constant several years after diagnosis; 2) to diagnose new SLM cases and find possible predictors of the SLM manifestation; 3) to estimate the prevalence and incidence of SLM in the cohort; and 4) to consider the symptomatology and importance of SLM in young Finnish people.

MATERIALS AND METHODS

In 1969–1970, a simple random sample of 151 children, aged 7–15, were selected from the population of a typical southern Finnish rural community, Pornainen, and 129 of them (85%, 60 boys and 69 girls) were examined (9). SLM was verified in 4 boys and 4 girls. The children were otherwise healthy, except for one girl with normal lactose absorption who had diabetes mellitus. There were no cases of general malabsorption. These 129 subjects form a fixed cohort that is followed and reexamined at about 5-year intervals.

About 5 years after the first examination, 118 subjects (91.5%) had the follow-up examination. The age of the
subjects ranged from 12 to 20 years. Seventeen subjects had moved away, 9 of them were examined. Two people refused to participate.

A lactose tolerance test with ethanol (LTTE) (10) was performed on all those examined. The criteria for lactose malabsorption (LM) were: 1) a maximum rise in blood glucose concentration of less than 20 mg/100 ml (1.1 mmol/liter) and 2) a maximum rise in blood galactose concentration of 5 mg/100 ml (0.3 mmol/liter) or less.

If a subject fulfilled both criteria for LM, a glucose-galactose tolerance test with ethanol (GGTTE) (10) was performed to exclude general malabsorption. Those people in whom SLM had been diagnosed 5 years earlier received no GGTTE.

Using a structured questionnaire, which was mailed in advance, people were asked about their gastrointestinal diseases and symptoms, food intolerances, and daily milk and sour-milk consumption. Replies to the questionnaire were reviewed by the authors during the examination. Abdominal symptoms which occurred on the days of the LTTE and GGTTE were recorded by means of a self-administered questionnaire.

RESULTS

Tolerance Tests

Eleven subjects fulfilled both criteria for LM in the LTTE. These included the 8 subjects in whom SLM had been diagnosed previously. Criteria for LM were not fulfilled in 98 subjects who were considered to have normal lactose absorption.

Results of the LTTE for 9 subjects were equivocal. Eight of them had a rise in blood glucose concentration of less than 20 mg/100 ml (14-18 mg/100 ml), but the rise in blood galactose was high (19-70 mg/100 ml). One subject had a rise in blood galactose of 5 mg/100 ml, but the rise in blood glucose was 50 mg/100 ml. Based on criteria used in previous studies (1, 2) all 9 subjects were considered to have normal lactose absorption.

No general malabsorption was found by the GGTTE.

Prevalence and Incidence of SLM

The prevalence of SLM in the cohort was 9.3% (11/118), with 95% confidence limits of 4.7% and 16.1% (11). There was no difference in the prevalence between two age categories and between the sexes. In the 12- to 15-year-olds the prevalence was 8.5% (4/47), in the 16- to 20-year-olds it was 9.9% (7.71). Among males the prevalence was 7.4% (4/54) and in females 10.9% (7/64).

Age-specific prevalence rates of the previous and present examinations are seen in Figure 1. In the 12- to 15-year-old age category the prevalence of SLM (8.3%) was the same for both examinations. The prevalence in the whole cohort (9.3%) was considerably lower than the prevalence in the adults (17%) of the same community (12) ($\chi^2 = 3.43$, one-sided $P$ value = 0.034).

Only 3 new SLM cases (out of 110 “candidates,” i.e. subjects who initially did not have SLM) became manifest during the 5-year follow-up. This means that the incidence density (“force of morbidity”) was 3 persons/500 person-years or 5.5/1000 years (13). The cumulative incidence rate during this 5-year time span was (5.5/1000 years) $\times$ 5 years or 2.7% (13). This was also the estimated risk of SLM in the subjects who had normal lactose absorption in the beginning of the period.

Results of Lactose Tolerance Tests in the Two Examinations

The mean rise in blood glucose was similar in the first and second examination for each group. For people with SLM the rise was $10.5 \pm 5.5$ mg/100 ml and $9.8 \pm 6.5$ mg/100 ml, respectively, and for those with normal lactose absorption, $41.6 \pm 13.5$ mg/100 ml and $39.0 \pm 15.8$ mg/100 ml, respectively. Considering the rises by individual, a positive correlation was found between the results in the two examinations: the correlation coefficient ($r$) was 0.33.

Comparison of blood galactose rises was not done, because in the first examination most subjects had the lactose tolerance test without ethanol (LTT).

The results of lactose tolerance tests in subjects with SLM are shown in Table 1. In two subjects in whom SLM became manifest during the follow-up period, the difference in the blood glucose rises between the examinations was great: 49 and 35 mg/100 ml (Table 1, subjects 10 and 11). In a third subject the difference was 3 mg/100 ml (subject 9).