There is concern in many countries about rising rates of caesarean section. In England and Wales, for example, the figures have almost doubled in two decades. Most comments on the rising trend, whether from hospitals, the public, or researchers, express dismay, as being either the report of a Parliamentary Select Committee. In response, obstetricians in the UK have set up studies such as the National Sentinel Caesarean Audit (England and Wales) and the National Audit (Scotland). In Canada the matter is being addressed by the Ontario Women's Health Project.2 These bodies note that in primary emergency caesarean section (i.e. caesarean section in primigravid women in labour) there are two main indicators—failure to progress in labour and fetal distress. To counter these they advocate greater use of outpatient in the future-prescriptive group (a strategy that can precipitate fetal distress) and careful evaluation of the fetus via scalp pH in the fetal-distress group. But such exhortations have had scant effect on the caesarean section rate. Further, when a caesarean section has been done for the first baby, there is a tendency to deliver subsequent babies in the same way; thus, an increase in the primary caesarean section rate has a multiplier effect on the whole rate. Why is it that modern caesarean childbirth is so frequently associated with difficulty? Only occasionally has anyone attempted to explain this.2 Prominent causes of caesarean section are failure to progress and fetal distress, the ultimate cause may lie in human ecology.

EVOLUTION

Looking around in nature we see that natural selection is a brilliant designer. Richard Dawkins often uses the codon of evolution as an example. Every living organism displays evidence of the complexity and inventiveness of natural selection. Yet, when it comes to ‘natural childbirth’ modern feto-maternal performance pays—despite the mother’s investment of huge resources during the nine months of gestation. The explanation is that cultural evolution has outstripped biological evolution.

The species H. sapiens evolved as a small-brained omnivorous private hunter-gatherer in Africa. His ancestors were hominid and anatomically modern living in Africa who had developed over several million years from earlier primates. Modern H. sapiens emerged in Africa less than one hundred years ago and through a combination of cleverness, dexterity and greed spread throughout all the habitable earth. The large brain contributed to this success but made the process of birth more difficult. It is a much tighter fit than hominid and pongid ancestors between the human infant head and the mother’s pelvis.

For most of his history H. sapiens lived in his own ecological niche, that of the hunter-gatherer. The total world population was small, possibly no more than a few tens of thousands of individuals, nomadic and consuming the edible animal, fruit and vegetables that they encountered. A large amount of exercise was taken to obtain food. A woman’s reproductive career began shortly after marriage at the age of 16–18.

All that changed with the invention of agriculture about 10,000 years ago. With huge increases in population and later industrialization the life of modern woman and man bears little relation to that of the hunter-gatherer. Because biological evolution cannot keep pace, man is a hunter-gatherer living in a 20th century world. Admittedly, where selection pressures have been very strong (e.g. malaria and the haemoglobinopathies) there have been dramatic changes. H. sapiens have increased in height and lost some of the thick, coarse body hair, but the human brain remains much the same. A pre-agricultural brain of tens of thousands of generations there have been only very recent generations of agriculturalism and just a few in the industrial era. Physicians and midwives have therefore proposed that several modern diseases, particularly breast disease and type 2 diabetes, are caused by a maladaptation to our current lifestyle. Similar arguments can apply to reproductive health and obstetric performance.

CHANGES IN HUMAN ECOLOGY

There are four chief ways in which this shift between biology and lifestyle could effect childbirth—diet, population density, exercise and reproductive behaviour. The diet in palaeolithic times was by most accounts richer in protein and poorer in carbohydrates, with a different pattern of fat.22 It was also very varied. In particular the carbohydrate component had little refined starch and sugar with much more fibre. The agricultural diet is high in some with less protein and fat, and more complex carbohydrates. The modern western diet is low in protein and complex carbohydrates. The society—fetal interaction depends on the abundance of food, especially sugar and fat with less protein than that of early upper palaeolithic man. In poorer parts of the world where protein is scarce, food consists largely of complex carbohydrates, while western tendencies and fast food are spreading to all parts of the globe.22

What of population density? The subtlety of agriculture enabled people to live in towns and cities rather than small settlements, and gave rise to a greater increase in population density. In consequence, infectious diseases, especially dysentery and enteric infection, became very common particularly in infancy and childhood. Conditions became even worse in the slums of the industrial revolution, where derelict living conditions were compounded by deficiency diseases.22 Such conditions are still found in mega-cities of the poor world.

What is not widely known is that the invention of agriculture and the development of settled living had pronounced effects on physical stature. Study of skeletons points to a decline in the mean height and a general reduction of height.22 Angel22 has tracked the pattern over thousands of years. Humans were tall in early upper palaeolithic times and did not become as tall again until the late 19th century in Western Europe and the USA. The third were always taller than the poor. Better nutrition and living conditions were associated with some increases in stature, but it is only in prosperous parts of the globe, with adequate children’s nutrition and control of infections diseases by nutrition and vaccination, that humans are reaching their full potential height. This process can take several generations is illustrated by data in immigrants to the United States.22

With growth in stature goes growth in pelvic size. Short stature has been seen as a risk factor for difficult labour; indeed, the first regular use of caesarean delivery was in short women with contracted pelves.22 Baird22 emphasized this in Aberdeen in the 1950s, and numerous studies have confirmed it. For example, in Western Australia22 primigravid women with height less than 160 cm had a rate of caesarean section four times that in women over 164 cm. Natural selection of women to be tall, with good pelvic capacity to allow delivery. Though many women are now tall, large numbers even in prosperous areas, have not grown to their full genetic potential.

Another change noticeable in primigravid women is a rising prevalence of obesity. This reflects a worldwide change which results from a combination of lack of exercise and a diet high in refined carbohydrates and fat. Obesity predisposes to difficult labour. A high body mass index > 30 has nearly three times the risk of caesarean section of a woman with BMI < 20.22 In Hunter-gatherers, from such evidence we see in remnant populations, were largely slim and physically active.22

Why obesity has a bad influence on childbirth is not the most plausible explanation that obese women tend to have large babies: the material-protein pregnancy weight is the best marker for fetal weight.22 Women have babies bigger because the body is proportionate to their size and because both bodyweight and maternal weight result from maternal diet or components of that diet (e.g. proportions of carbohydrate and protein).22 Data from Scotland and China22 point to an increase in fetal macrosomia, and it seems that babies are getting bigger as women are getting fatter. Bigger babies undoubtedly have higher caesarean section rates.22 In communities where the babies are small, the caesarean section rate is low.

The final important change in human ecology is maternal age at first delivery. Hunter-gatherers had their first child when aged 17–18. Culture, education, contraception and abortion have allowed women to delay first childbirth. Whatever we look in the western world, women are putting off having their first baby.22 The biological disadvantages, with more infertility, more miscarriages and more caesarean sections. From Fisher’s work onwards, many studies point to an increasing incidence of caesarean section with maternal age. Why age has this effect is not obvious. Perhaps labour is made more difficult by change in the connective tissues and the collagen in the uterus and cervix.22 Such changes are a result of changes in a cultural, economic and educational viewpoint there are great advantages in delaying first childbirth, from a biological standpoint increasing maternal age is a clear advantage.

CONCLUSION

Changes in diet, population density, exercise and reproductive behaviour mean that primigravid women are commonly shorter, older and fatter than is ideal for first childbirth. These adverse factors have been well recorded: a paper by Cnattingius et al.23 showed that primiparae under 20 cm and over 164 cm in height had an emergency caesarean rate of 22% while those over 164 and less than 160 cm had a rate of 38.2%. Yet, some authors, including the National Sentinel Audit, have ignored these factors and their importance is not widely appreciated by either the medical profession or the general public. The lowest caesarean rates in the western world are in the Nordics, and the French and in the Netherlands, where women are tall and there is little disparity between health and nutrition within different sectors of society.

When these anthropomorphic factors are added to influences such as the National Sentinel Audit (England and Wales) and the National Audit (Scotland). In Canada the matter is being addressed by the Ontario Women’s Health Project.2 These bodies note that in primary emergency caesarean section (i.e. caesarean section in primigravid women in labour) there are two main indicators—failure to progress in labour and fetal distress. To counter these they advocate greater use of outpatient in the future-prescriptive group (a strategy that can precipitate fetal distress) and careful evaluation of the fetus via scalp pH in the fetal-distress group. But such exhortations have had scant effect on the caesarean section rate. Further, when a caesarean section has been done for the first baby, there is a tendency to deliver subsequent babies in the same way; thus, an increase in the primary caesarean section rate has a multiplier effect on the whole rate. Why is it that modern caesarean childbirth is so frequently associated with difficulty? Only occasionally has anyone attempted to explain this.2 Prominent causes of caesarean section are failure to progress and fetal distress, the ultimate cause may lie in human ecology.

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