



Essential Knowledge to Impart to Young Women about the Specifics of Human Sexuality/ Reproduction

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ABSTRACT

Homo sapiens appeared some 300,000 years ago and our female ancestors delivered obligatorily vaginally prior to the development of medical interventions (such as caesarean sections, a safe procedure only since the 1960's). Furthermore, women are unique among the 4,300 mammal species suffer from a harmful complication of pregnancy, preeclampsia (especially during a first pregnancy). This paper explains first, concerning physiological vaginal first birth (primiparity) why young women should consider delivering her first baby before the age of 26 (there is a linear association between maternal ages and healthy deliveries). Second, because of the comparatively large human fetal brain, nutritional maternal-foetal exchanges are twice those of other mammals (per body-mass ratios). But, as the human species has retained the hemochorial placenta, that first appeared in mammalian evolution, women face the great challenge of immunological tolerance towards the male partner's tissues during the nine months of gestation. This major challenge occurs during the first pregnancy and tolerance is related to semen exposure prior to conception. In subsequent additional pregnancies, immunological recognition is largely achieved through the initial pregnancy. This is why for a first pregnancy (nulliparous woman or multiparous woman with a new male partner), it is preferable to conceive after a delay of 6 months of non-barrier contraception before planning conception. In case of short sexual cohabitation since the constitution of the couple (partial recognition of the male's tissue), implantation of the embryo may be partially insufficient, leading to complications such as fetal growth restriction and/or early onset preeclampsia. Third, to have a baby neither too small, nor too big, women overweight or obese at the beginning of any pregnancy must gain less weight during the 9 months of gestation as compared to their leaner counterparts. The optimal gestational weight gain may be acknowledged during the first prenatal visit, with, a goal to achieve during the next 7- 8 months of pregnancy.

Keywords: Preeclampsia, immunology, obesity, epidemiology, gestational weight gain, caesarean sections

INTRODUCTION

In a recent publication (April 2023) Stock & Aiken state « “Healthy pregnancies are fundamental to healthy populations, but very few therapies to improve pregnancy outcomes are available (.....). A key issue is that research efforts must capture the complexity of the tripartite maternal-placental-fetal system, the dynamics of which change throughout gestation “[1] Hence, we find that much knowledge has recently accumulated that can highly improve the final outcome of ‘holy grail’, a healthy pregnancy. This article highlights advances of the 21st century (It could not have been written in the year 2000 which still belonged to the 20th century).

There is a lack of awareness among young of the very specific reproductive and sexual strategies of humans as compared to other mammals (4,300 species). Acknowledgement of specifics are critical in the management of women’s reproductive lives. Disseminating this knowledge is the goal of this article and is synthesized in the SYNOPSIS at the end of this article. There is summarized the four main points indispensable to be acknowledged by all young women.

- First the knowledge that the human fecundity rate is the lowest among the 4,300 mammal species, and further that this fecundity rate declines with women’s age, and becomes very low after 35 years of age.
- Second, how to maximize the chances to have a successful first pregnancy (“primiparity”) avoiding some maternal or foetal complication such as preeclampsia (gestational hypertension and proteinuria in the maternal side) or impaired foetal growth in utero (“intrauterine foetal growth retardation” on the newborn’s side).
- Third, at what age is it better to make a first baby to have the best chance to achieve a physiological birth (i.e., avoiding a cesarean section).
- Fourth, and finally, what to do in case of maternal overweight or obesity at the beginning of a pregnancy to cope with having the safer deliveries.

This publication represents a synthesis of 35 years of personal research in perinatology (and therefore a number of self-citations). Point 1 and Point 2, human fecundity and immunology of trophoblastic implantation are now well established (it was absolutely not the case in the year 2000 for immunology of reproduction [2-8]). Points 3 and 4 are new and still in debate. However, the point 3 (best age to have a first baby) found a recent confirmation by the team of Ganerival et al in 2022 [9] in a different population (Ireland) than the original description in Reunion Island [10]. Concerning Point 4 (methodology to define the optimal individual gestational weight gain adapted to every woman since the first prenatal visit) [11] also had a spectacular confirmation in July 2022 by Lin, Huang, Fan et al in twin pregnancies in the US National perinatal database of 200,000 pregnancies [12]. The core of this article then develops in different paragraphs the scientific backing of all aspects.

TOLERANCE/ACCEPTANCE OF THE FŒTUS BY THE MOTHER FOR A DURATION OF 9 MONTHS. INTRODUCTION TO THE CONCEPT OF PREECLAMPSIA (WITH OR WITHOUT FŒTAL GROWTH RESTRICTION).

The Basic Placental Differences in Human as Compared to Other Mammals

In 1954 Sir Peter Medawar (Nobel Prize in 1960 [13]) developed the notion of the the «foetal-maternal paradox»: He asked how can a female mammal tolerate carrying within her womb an

individual who is hemiallogenic (comprising maternal and paternal antigens) without rejecting it (the “foetal allograft”)?

Histologically (i.e., microscopically), there are 3 major kinds of placentae among the 4,300 species of mammals [14]. Two types have a physical biological barrier between the mother’s side and the foetus minimizing then the maternal-foetal tissue contacts (and possible immunological conflicts towards the “foetal allograft”): Either an epithelium (epitheliochorial placenta, e.g., pigs, horses, dolphins...) or an endothelium (endotheliochorial placenta, e.g., cats, dogs, carnivores...). The two units (mother and foetus) are doubly separated. The third type is hemochorial (e.g., rodents, primates, humans). Here, the situation is totally different: there is no real microscopic physical barrier between the mother and the foetus, tissues are entangled [14] and direct immunological maternal-foetal interactions enter in play. This is the case in humans, where additionally the trophoblastic invasion is much deeper than in rodents or primates.

Further, macroscopically, the Human placenta is discoidal in shape like other haemochorial placentae (e.g., apes, monkeys, rodents also) and cannot expand widely on its edges. Also, in humans the hemochorial placenta is sole to be highly invasive, through the decidua and into the first third of the uterine muscle (myometrium), all in order to increase nutritional exchanges between the mother and the foetus. In other mammals, the placenta just contacts the wall of the uterus and never the muscle, it remains superficial to the decidua (mucosal membrane).

For mammal species with epitheliochorial placentae such as dolphins, horses, pigs have a diffuse placenta expanding widely in the maternal uterus or cotyledonary (e.g., cattle, sheep, goats, deer). These shapes allow a great surface of maternal-foetal exchanges avoiding then the “necessity” of a deep trophoblastic invasion. Tolerance of this deep invasion by the human mother demands an immunological adaptation to the male immunological antigens at a far higher degree than their female mammal counterparts. See, next paragraph.

Immunology of Reproduction (“foetal allograft”) [2-8]

How can then a mammal female tolerates in her womb an individual who carries half foreign tissues (those of the father) without rejecting it («foetal allograft»)? especially in the human species where the implantation of the embryo is particularly deep (1/3 of the uterine wall).

The human female is unique among mammals, because of the huge foetal nutritional needs for the foetal brain, necessitating this very deep placental implantation. This half foreign embryo has to be accepted by the maternal immune system as ACTIVE recognition (not an immune deficiency) [2,6,7]. A first pregnancy is therefore an immune challenge/habituating between the mother’s immune system and the tissues of her male partner. It is now well established that this immune ‘tolerance’ is driven through sperm exposure [3-5]. By an evolutionary adaptation, our species is one of the rare mammals which practices intercourse all year long, without a periodical «oestrus period». This is not because the humans should be a twisted “obsessed by sex” mammal species (all the year long), but because it is a biological adaptation to the necessity of a good immunological knowledge of the father’s genes. In heterosexual couples, women living cohabitates permanently with a foreign biological tissue in her body (expectancy of life of sperm is of 3-5 days in the female genital tract), and it is now well-known that she presents

obligatorily immune responses to that tissue physiologically directed towards immune tolerance [5]. It is a biological necessity of evolution in order to reach the indispensable tissue contacts to allow for successful trophoblastic implantation, and later, a safe pregnancy.

However, in certain circumstances, this immune adaptation is not yet achieved driving a tissue rejection toward the trophoblast. It may be a strong rejection, and this first trophoblastic implantation will result in first trimester miscarriage rejection (~15% of all human fecundations) [2]. It may be also a 'mild' rejection: the first trophoblastic implantation occurs (no first trimester miscarriage), but the deeper necessary invasion of the myometrium does not occur. In a certain way, we may think that this pregnancy will be similar to other mammals (decidual implantation only). But this decidual (mucosal) implantation in humans represents a shallow implantation. Then, the physiologically intense nutritional maternal-foetal exchanges in humans will be compromised until term. This shallow implantation will lead to a chronic intra uterine growth retardation (IUGR) for the foetus giving at birth a "small for age" (SGA) newborn [15].

Additionally, to this compromised foetal growth it may also occur a global maternal vascular inflammation: preeclampsia. Inflammation of the kidney vessels will lead to hypertension and proteinuria (glomerulo-endotheliosis). If there is also present vascular inflammation of the liver, the mother will experience HELLP syndrome (haemolysis, elevated liver markers, thrombopenia). If the inflammation localizes to the cerebral vessels, the mother will present Eclampsia (epileptic seizures, convulsions, "grand mal epilepsy").

The Pivotal Role of the Father in Humans

In a recent review, we proposed: "Considering human pregnancy as a 'maternal-fetal graft paradox' (at the highest degree among the 4,300 species of mammals), it is reasonable to hypothesize that at the first establishment (primiparas and new partner multiparas) of a 'couple's symbiosis' might be less successful regarding perinatal outcome compared with same partner multiparas. In subsequent same partner pregnancies immune tissue habituation has already been primed by a first pregnancy" [16], including prior volunteer abortion or miscarriage with the same partner [17]. New paternity pregnancies are also at a higher risk of preeclampsia compared with same paternity multiparous women [8], what is coined now by the term 'primipaternity' [16,18]. Fortunately, for the vast majority of human pregnancies this immunological tolerance takes place harmoniously. Women who are at risk of partial foetal rejection are those conceiving during the three or four first menstrual cycles (short sexual cohabitation) while they are not yet accustomed with the male partner's tissues [15,18]. For a successful pregnancy then, it is much better to conceive a baby only after 6 months of sexual cohabitation after the establishment of a couple (excluding barrier contraception such as condoms).

ANTHROPOLOGY: THE AMAZING HUMAN «EXTRAVAGANT SEXUALITY»

In the Preface of a recent book by Ryan & Jetha [19], Pascal Picq, a French anthropologist, wrote in 2021: Facing this apparent human hypersexuality "What can be the evolutionary advantage of such a burst of physical activities.... Anthropologists have been looking for the answer for a dozen of years". Ryan and Jetha, Picq, Diamond, and Léridon face the same mystery [19-22]. At this beginning of the 21th century they had no biological hypotheses/explanations [19,22]. Before that, in a seminal book in 1997 [20] Jared Diamond, an anthropologist and zoologist

(working on all mammal species), proposed a trinity of decisive characteristics distinguishing between humans and apes: POSTURE (upright position), BRAIN SIZE, and EXTRAVAGANT SEXUALITY [20].

Upright Posture And Foetal Brain Size

Upright stature induced an adaptation of the pelvis to for allow harmonious walking without swinging. But women with this type of pelvis had also to cope with parturition. The upright stature induced special compromises for the shape and the size of female's pelvis (allowing walking as well as parturition). But, further, our infants have one of the biggest brains at term of body size ratio among animals. Our fetuses and newborns starting at the last trimester of pregnancy until the first three months of life, have fantastic permanent brain growth: the foetal head circumference gains half a centimeter PER WEEK (2 cm per month) to reach 35 cm at birth.

It should have been frightening to have bigger brains than 35 cm at term to allow the passage of the foetus through the maternal pelvic bone structure. Head size of the newborn is the major variable for the mechanical success of human delivery (which is absolutely not the case in other mammals where possible obstructed labour is never due to the foetal head). That is why *Homo sapiens* deliver relatively neurological premature newborns, completely dependent of intensive neonatal care during their first year of life. Our neonatal skulls have even also been adapted with the fontanells and sutures to allow a plasticity (if a shrink of the cranial bones was needed during the pelvic descent). These fontanells and sutures are fused at 9 months of life.

Why Human Pregnancy Needs High Levels Of Nutrient Exchange Between The Mother And The Foetus?

During the last trimester of pregnancy growth of the fetal brain demands of the mother 60% of total nutritional supply (20% in other species of mammals). Head circumference measures 35 cm at birth and 41 cm at 3 months of life (47 cm at 12 months of age). In comparison to body-weight ratios, the human female furnishes her foetus with 200% nutritional exchanges more than other mammals [23]

“Extravagant Sexuality”. Why Zoologists/Anthropologists Are Intrigued By Human Sexuality/Reproduction? [19-22]

Zoologists are scientists specialized in comparative biology of the 4,300 species of mammals. Summarized in Figure 1, we present the main puzzles that they are facing concerning the human females' sexuality/reproduction.

1. First, they are amazed that the human female presents an incredibly low-rate of fecundity: the natural maximal fecundity rate (for a couple without any risk factor, feminine or masculine, with a woman aged of 25 years, and having regular unprotected sexual intercourse) is of 25% per month. It is much higher in other mammals who present a fecundity rate of approximately 85-95% at time of oestrus. It is of paramount importance for young women to know that this fecundity rate is of 25% at 20 years of age, 15% after 30 years, and 6% after 40). With cumulative cycles, 60% fertile couples will achieve pregnancy within 6 months, 80% within one year, and 90% within 2 years. On average, the most fertile couples in their twenties take 7 months to conceive [21].

2. Second, human couples have intercourse all year long and do not have phenomenon of oestrus (specific periods of reproduction) like other mammals.
3. Third, the zoologists to date conclude that human reproduction appears to be monumentally inefficient from a biological point of view. For example, everyday ap. 230 million human couples have sexual intercourse, in the same time everyday 400,000 human babies are born. This gives a reproductive efficiency 2 per 1000 copulations. In terms of reproductive success, sexual intercourse occurs at the wrong time for conception in the vast majority of cases (99.98%). [22].
4. Fourth, women have a concealed ovulation: males have no access to specific signs leading to know when the human female is ovulating. It is so concealed that even women, in more than half of cases do not feel themselves that they are ovulating [19-22].

Answer To Diamond, Ryan & Jetha, Picq And Leridon: Humans Had To Do An Indispensable And Very Smart Evolutionary Adaptation Because Of The Human Big Foetal Big Brain. Table 1. [24]

All taken together, we were facing anthropological and biological puzzles for zoologists. Their questionings are summarized below in Table 2, with our biological answers on the facing column. In fact, the «extravagant sexuality» may indeed be a smart evolutionary adaptation to the specificities of the human placenta and the nutritional demands of the human foetus. [24], Figure 1.

ANTHROPOLOGICAL MYSTERIES OF HUMAN SEXUALITY/REPRODUCTION	ANSWER: EVOLUTIONARY ADAPTATION OF THE HUMAN REPRODUCTION
(challenged by zoologists working on 4,300 species of mammals)	
• Low fertility rate (20-25%) • Loss of oestrus • Concealed ovulation • No sperm competition at conception • Society, nuclear families, marriage • Common parental care (birds) • Testes size of human males • (Menopause)	• « Necessity » in humans of a foetal big brain • Therefore a deeper trophoblastic implantation (nutritional exchanges) • BUT hominids have HAEMOCHORIAL placentae: intimate cohabitation between maternal and paternal (trophoblast) tissues. Therefore major immunological issues of compatibility-tolerance. • Maternal habituation to paternal tissues through a significant sperm exposure => low fertility rate • Therefore, loss of estrus (impossible with a 25% fertility rate) • <u>Concealed ovulation</u>: To remain constantly attractive

Figure 1: Zoologists' "Puzzle" On Human Sexuality/Reproduction [17]. Possible Explanations (Right Column)

AT WHAT AGE IS IT BETTER TO DELIVER A FIRST BABY? («NULLIPARITY» OR «PRIMIPARITY»). [9,10]

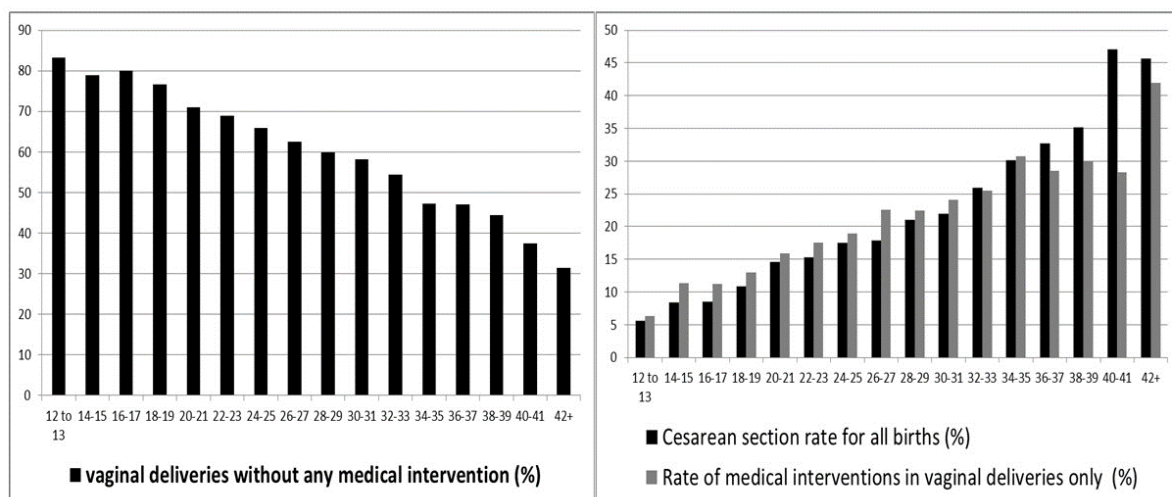
Nowadays, women have still kept the traits of their female ancestors: young women (and teenagers) deliver much healthier than their older counterparts. [9,10] This is shown in Figure 2: the left part of the Figure shows the proportion of primiparas delivering vaginally without any medical interventions. For example, a 16-year of age deliver without any medical intervention in 80% of cases while it is only 55% for a of 30-year primipara. Whereas, the right part of the figure shows the rate of medical active intervention: In our experience, the

caesarean sections rate is of 5% for a woman of 16 years of age, while it is 22% for a of 30-year primipara. C-sections have become a safe procedure for women only in the 1960's. Besides this minute period of 60 years since the existence of Homo sapiens (300,000 years) caesarean sections were not safely available to our female ancestors.

But there are also active medical interventions in vaginal births to help with the extraction of the baby: forceps, spatules or ventouse (vacuum), gray histograms. It is of note that teenagers already delivering naturally mostly without any help (80%) also need very few extractive assistances: 11% for a 16-year primipara, while it is 24% for a of 30-year-old primipara.

In summary, during 99.9% of the existence of Homo sapiens, young women could deliver relatively safely only with the help of matrons (In paleolithic or Neolithic times women never delivered their first baby at 30 years of age). The human female has been “shaped”, like all mammals, to begin reproduction since puberty. Still nowadays then, it is better to deliver a first baby in the early twenties [9,10].

FIGURE 2. Birthing without any medical intervention (vaginal extraction or caesarean section) by maternal ages, all births N= 22,862. . Rate of medical intervention at birth by maternal ages 1) caesarean section for all singleton births N= 22,8622) Rate of medical intervention in vaginal deliveries only, N= 18,719. [10]



WHAT IS THE OPTIMAL GESTATIONAL WEIGHT GAIN DURING PREGNANCY FOR A PREGNANT WOMAN?

We have recently shown that “There is a peculiar phenomenon: two separate individuals (mother and foetus) have a mutually interactive dependency concerning their respective weight” [11]. Birthweights are displayed as a Bell curve (Gaussian or “normal” curve). By international convention it has been agreed that the 10% of birth on the left of this Bell curve are considered as being “too small” (small for gestational age, SGA). Those 10% of births on the right part are being considered as “too big” (Large for gestational age, LGA). It is well-known that women with a normal BMI (20-24.9 kg/m²) seem to achieve a “natural” equilibrium in the newborns’ SGA/LGA risk (both 10%). Very thin mothers have a higher risk of small for gestational age (SGA, until 25% of births) infants, and rarely give birth to a large for gestational age (LGA) infant. While severe obese women often give birth to LGA (20-25% of births), and

rarely to SGA. This equilibrium in the SGA/LGA risk (both 10%) is materialized geometrically by a crossing point: the Maternal Fetal Corpulence symbiosis (MFCS) [11].

Based on the simple axiom: “what is the optimal gestational weight gain (optGWG) at term for pregnant women to achieve to have a ‘normal’ neonatal population?”, neither too small, neither too big (i.e., 10% of SGA and 10% of LGA), we have shown also that this MFCS point could exist in all women with an optimal gestational weight gain (OptGWG) adapted to the maternal pre-pregnancy BMI. Further, this optGWG is a mathematical linear equation, $y = mx + b$. This has been recently (JAMA, July 2022) confirmed for twin pregnancies in the large US National database of 200,000 twin pregnancies: it is also a linear law to achieve a normal birthweight distribution in twin newborns [12]

These 2 linear curves for singleton and twin pregnancies are reproduced in Figure 2. We have in Reunion Island for 4 years now a calculator of optimal gestational weight gain in singleton pregnancies for our population, accessible on a smartphone at REPERE.RE [24] At the first prenatal visit every pregnant woman may know as a goal her personal gestational weight gain to achieve the next 7-8 months of pregnancy. The new way to calculate optimal GWG needs to replace the 2009 IOM guidelines, and the major challenge in antenatal care is and will be to educate, motivate, and professionally support overweight and obese pregnant women to achieve their individual optimal GWG.

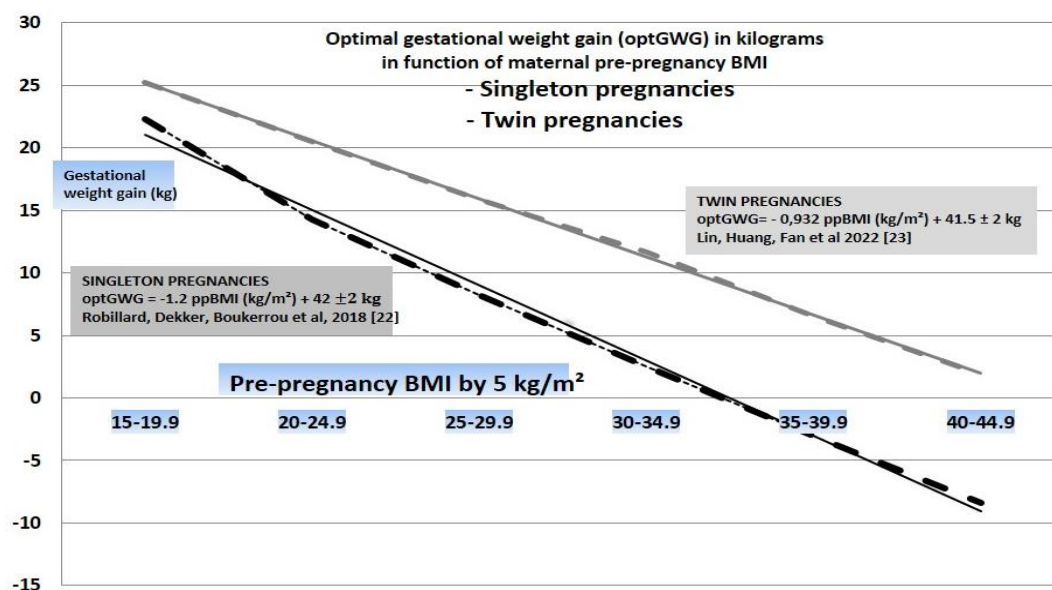


Figure 3: Optimal gestational weight gain in singleton and twin pregnancies [11,12]

WHAT ALL YOUNG WOMEN NEED TO KNOW ABOUT REPRODUCTION

I. HUMAN FERTILITY.

Compared to the 4,300 species of mammals, the fertility rate of women is incredibly low: 25% at age 20, 15% after 30, 6% after 40. If a 25-year-old woman has sex on the day of ovulation, she has only a one in four chance of conceiving (one in seven if the woman is over 30).

It is better to conceive a first baby when a woman is between 20 and 30 years old and preferably before the age of 26. (At age 35, normal fertility is 10% per menstrual cycle).

II. HOW TO HAVE THE BEST CHANCES OF SUCCESSFUL IMPLANTATION OF THE EMBRYO DURING A FIRST PREGNANCY.

Pregnancy in mammals can be considered as a "semi-allograft": accepting a semi-foreign individual (tissues inherited from the father) throughout the pregnancy. Therefore, women must be fully immunologically prepared for the tissue specificities of their male partner BEFORE starting a pregnancy. But the woman has this unique feature among the 4,300 species of mammals: the nutritional needs required by the human fetus are multiplied by 2 (compared to the body mass of the mother), indeed, 60% of the nutritional contributions are only intended for fetal brain growth vs 20% in other mammals. This tolerance is not due to a relative drop in maternal immunity but, on the contrary, associated with a very strong immune recognition of the "foreign" aspect of the placenta: the woman is perfectly aware that she is dealing to foreign antigens, but then a process of tolerance to this "graft" is set in motion. This active recognition is acquired by prior and repeated exposure to the sperm of the male partner for approximately 6 months to allow sufficient recognition of the paternal antigens (without barrier contraception such as condoms). If this active recognition/tolerance is not acquired, insufficient placental (or "trophoblastic") implantation can lead to pregnancy complications for the fetus (delivery of a "small for gestational age" baby, SGA) or maternal complications such as preeclampsia (hypertension during pregnancy and proteinuria). This active recognition/tolerance is perfectly established after a first pregnancy with a partner for subsequent pregnancies. On the other hand, this protective effect disappears if it is a pregnancy with a new father. It is therefore important to inform the doctor or midwife during prenatal visits if it is a new father. If conception is achieved less than six months after establishing a relationship with this new partner, preventive treatment with aspirin from the first trimester of pregnancy may be advised. With the same father, any previous pregnancy (including miscarriage or abortion) protects against complications (preeclampsia, SGA).

To achieve good implantation of the placenta during a first pregnancy with a male partner, it is preferable to have a period of six months of sexual cohabitation before conception (excluding barrier contraception such as condoms).

III. SUCCESSFUL FIRST DELIVERY ("PRIMIPARITY").

There is a marked difference between the first birth (primiparity) and subsequent births (multiparity). The duration of labor for the first vaginal birth is 4 to 5 times longer than for a second or third child. A first successful childbirth is above all highly protective in order to avoid a caesarean section during subsequent deliveries. Having a FIRST successful natural vaginal birth without any medical intervention (eg. forceps, vacuum cup, or caesarean section) is linearly associated with maternal age: younger women are more likely to give birth vaginally. Teenage girls give birth much better than women in their 20s and 30s, not to mention women over 30. Women have been "shaped" by evolution to begin reproduction at puberty, like all mammals.

It is preferable to have a first baby before the age of 26 to optimize the chances of having a childbirth without medical intervention (vacuum, forceps, spatula, caesarean section)

IV. OPTIMIZE THE CHANCES OF HAVING A "WELL-SHAPED" BABY IN CASE OF OVERWEIGHT OR OBESITY: WEIGHT GAIN DURING PREGNANCY.

Thin women (BMI < 18.5 kg/m²) give birth better vaginally than women with a normal BMI (between 20 and 24.9 kg/m²), themselves giving birth better than overweight women (25 to 29.9 kg/m²) or obese women (more than 30 kg/m²). All this is also regular and linear. Overweight and obese women need to gain less weight during pregnancy than thinner women to have a baby that is neither too big nor too small ("appropriate weight for gestational age"). This is a promising approach because optimal weight gain can be determined during the first prenatal visit.

The optimal weight gain (kilograms) during pregnancy can be assessed from the beginning of pregnancy. A calculator is available on Smartphone @ REPERE.RE. Just enter as data the woman's weight and height before pregnancy.

CONCLUSION

Homo sapiens appeared some 300,000 years ago and our female ancestors did not have safe availability of caesarean sections. Nowadays, we have enough data to state that the human female has evolved for optimal first delivery («nulliparity») at a young age, at the end of adolescence or in their teens. There is a linear law between maternal ages and need of medical

interventions (caesarean sections, forceps, vacuum extractions) at first births. A successful first delivery (vaginal route) will prime the rest of additional births. It is better to have the first baby before 26 years of age to maximize the chances of a physiological birth. The human female having to accept the «fœtal allograft». For a first pregnancy with a male partner, has to establish a specific and active immune tolerance. For that, it is better to wait 6 months of sexual cohabitation before conceiving a first pregnancy in that couple. In subsequent same partner pregnancies immune tissue habituation has already been boosted by a first pregnancy" (including prior volunteer abortion or miscarriage with the same partner). Finally, there is no fatality for overweight or obese women to have many more complications of pregnancy or childbirth (gestational diabetes, overweight baby, cesarean sections, etc.). It is necessary to adapt her weight gain during the 9 months of pregnancy according to her initial corpulence (corpulence before pregnancy). This gestational weight gain can be known from the first prenatal visit.

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