

## AN AYURVEDIC ANALYSIS OF TWINNING PHENOMENON – EXPLORATION OF SOME UNRAVELLED AREAS OF HUMAN REPRODUCTION

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### ABSTRACT

Twinning is a phenomenon which fascinates both medicos and non medicos. Twins are miraculous creatures of nature and share unique relationship among them. But at the same time multiple pregnancies are considered as ‘high risk pregnancies’ associated with maternal complications, perinatal morbidity and mortality. Twinning is associated with wide range of impacts on family, society and national economy. It burdens the economic productivity since more frequently it is associated with congenital anomalies impairing the life of an individual. Previous literature has found associations between twinning and its allied pathologies but none of them has related the pathology behind twinning and several other congenital anomalies. In ayurveda this phenomenon is regarded as highly pathological. To explore the details about the phenomenon a pilot survey was conducted in a village of kerala (India) having twinning frequency four times the national average. Survey reports are showing substantiation of vata humour which is mainly of obstructive type. Maximum vitiation is found for the two subtypes of vata governing the lower pelvic area which is 30% and 23.3% respectively. By odds ratio, this is significant in twin mothers by 2.327 and 4.261. Odds for all three humours is significant with Vata-1.714, Pitta-1.125, Kapha-1.536. Other parameters are also substantiating previous studies. Analysis through ayurveda shows that twinning is pathological and is maximum pertaining to the food and lifestyle pattern of twin mothers.

**Key words:** Twinning, Congenital Anomalies, Pathology, Ayurveda, Kodinji, Prakriti, Doshas

### INTRODUCTION

Twinning among humans is many times considered as the boon resulting from super fecundity of mothers. At the same time multifetal gestations are coined as ‘high risk pregnancies’ because of complications it produces in both mother and fetus like prematurity, low birth

weight, pre-eclampsia, anaemia, PPH, IUGR, congenital anomalies, neonatal morbidity and high neonatal & infant mortality. Multiple pregnancies are result of complex interaction between a wide range of genetic and environmental factors including race/ethnicity<sup>1</sup>, geographical distribution and climatic conditions<sup>2</sup>,

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maternal age<sup>3</sup>, parity<sup>4</sup>, food<sup>5</sup>, lifestyle<sup>6</sup>, maternal height and weight<sup>7</sup>, smoking<sup>8</sup>, alcohol<sup>9</sup>, use of contraceptives<sup>10</sup>, socio economic status<sup>11</sup> and other epidemiological factors<sup>12</sup> etc. The increase in the trends of incidences has raised the curiosity to explore the phenomenon as high twinning rates points to the existence of a great public health challenge with increasing burden on family, society and national economy. Maternal morbidity is reported to be 7 fold greater in multiple pregnancies than in singeltons<sup>13</sup> and perinatal mortality rates are reported to be 4 fold higher in twins (33.1/1000), six fold in triplets (56.2/1000) than singletons (7.4/1000) with cerebral palsy (CP) rates at one year of age, 4 fold higher in children of multiple births (5.9/1000) than singletons (1.4/1000)<sup>13, 14</sup>. Till now researchers have found various allied morbidities associated with twining, congenital anomalies being the prime one but none of them has related the pathology behind twinning and pathology behind several other associated conditions. In the current situation, an *ayurvedic* analysis to such a phenomenon may be helpful to explore the pathology of complex unexplained interactions of factors resulting to mysterious phenomenon. The literature of *ayurveda* contains facts about almost all spheres of life including some epistemological understanding regarding twinning and its allied pathologies. In this regard, we conducted a prime pilot study at a place reporting abnormally high frequency of twinning. Kodinji, a small village in Kerala (India) has more than 230 pairs of twins with no more than 2000 households (14,600 inhabitants) with twinning rate of 5%<sup>15</sup>. Such a high frequency twinning (four fold as compared to national average of 0.8%) is extremely

striking although India has one of the lowest twinning rates in the world which is less than 9/1000<sup>16</sup>. Till now no study has been undertaken to explore this phenomenon.

### Aims and objectives

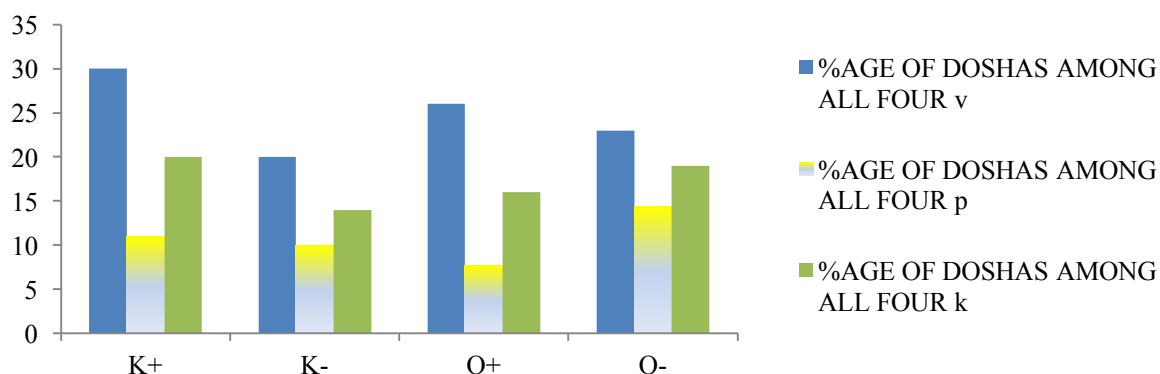
1. Elucidate the causation behind twinning mechanism in terms of *ayurvedic* etiopathogenesis so as to frame a hypothesis regarding upcoming untoward health events related to twinning.
2. Constitutional analysis for any significant imbalance of body humours particularly among the mothers of twins as per *ayurvedic* principles of body constitution (*Prakriti*).

**Materials and methods:** A survey was conducted among kodinji population and general population at the sites other than kodinji. Survey was done using questionnaire method and to find out the strength of association between outcome (twinning) and exposure (risk factors) odds ratio was calculated. There were four groups in the study each comprising of n =10 (total n<sup>t</sup> =40). Group A (K+) and B (K-) were exposed cases and non cases while group C (O+) and D (O-) were non exposed cases and non cases. Stratified random sampling was done to select the appropriate sample. As the village had 7 wards so two cases one with twin and other with non twin were selected randomly from each ward. The other three cases of twins were special cases from the families having triplets or where most of siblings in 2<sup>nd</sup> generation (father, father's brothers & sisters) had parallel twins. In general population twins and non twins were selected from different *panchayats*. Information was obtained on general socio-demographic habits, personal characteristics and personal habits,

gynaecological and obstetric history, food & lifestyle. The data were entered into an ayurvedic questionnaire after informed consent was obtained from the mothers. Then mothers of both cases and controls in both populations were interviewed as per the questionnaire. All data were entered into Microsoft excel version 2007. Association of risk factors under study was to be assessed by applying chi-square test but since sample size was small so chi-square was not accurate instead Fischer's exact test was done. To assess the association between risk factors and outcome odds ratio (OR) and 95% confidence interval of OR was calculated.

**Observations :** Firstly we compared the all 4 groups together on a particular variable for any difference between kodinji group as compared to general population group. If there is any positive association then kodinji women ( K+ & K-) were compared to find out whether kodinji twin mothers (K+) differ significantly from kodinji non twin mothers (K-) for the same variable. And lastly we compared only twin mothers of both groups, kodinji twin mothers and twin mothers in general population (K+ & O+) for any significant difference in the variable which might have been contributed by that particular geographical area if any.

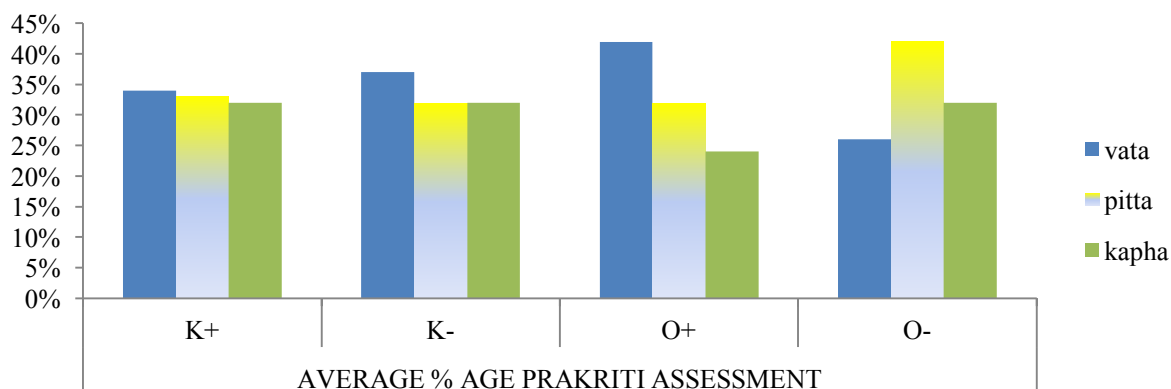
**Fig. 1 Status of morbid doshas among kodinji people**



**Table 1: Association of morbid doshas with twinning (Odds ratio at 95% C.I)**

| Group   | Vata dosha        | Pitta dosha       | Kapha dosha       |
|---------|-------------------|-------------------|-------------------|
| K+ & K- | 1.714 (0.8 – 3.2) | 1.125 (0.4 – 2.9) | 1.536 (0.7 – 3.2) |

**Fig2. Status of body constitution/prakriti among kodinji people**

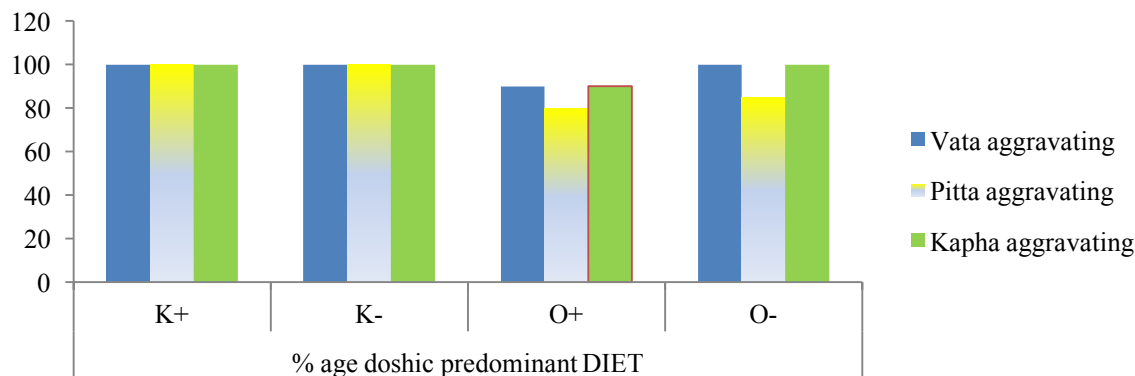


**Table2: Association of body constitution/prakriti with twinning (Odds ratio at 95% C.I)**

| Group   | Vata dosha        | Pitta dosha       | Kapha dosha       |
|---------|-------------------|-------------------|-------------------|
| K+ & K- | 1.714 (0.8 – 3.2) | 1.125 (0.4 – 2.9) | 1.536 (0.7 – 3.2) |

|         |                  |                  |                      |
|---------|------------------|------------------|----------------------|
| K+ & K- | 1.50 (0.2 – 8.8) | 1.50 (0.2 – 0.8) | 0.6667 (0.11 – 3.92) |
|---------|------------------|------------------|----------------------|

**Fig 3. Status of food in terms of Predominance of doshas among kodingi population**



**Table3: Food status in terms of doshas and its association with twinning (Odds ratio at 95% C.I)**

| Group 2 |                   |                   |                   |
|---------|-------------------|-------------------|-------------------|
| K+ & K- | 0.642 (0.1 – 2.3) | 1.063 (0.4 – 2.3) | 1.063 (0.4 – 2.3) |

## DISCUSSION

High frequency twinning suggests the vitiation of body humours in excessive amount in a large number of people sharing something in common on the basis of seasonal, traditional (food and lifestyle), geographical and cultural backgrounds, indicating the disturbance and widespread effects on human reproductive system. It is a pathology pointing towards the ‘deviation of normal processes’ of the body due to change in composition of body humours which has resulted in disequilibrium of body elements at subtle level. The complex interaction between etiological factors in terms of number of factors, the manner of interaction and depth or bonding of interaction at different levels governs this pathology, which may not be the reason for twinning only but for the other associated adverse outcomes of pregnancy also. According to *ayurveda* twinning itself is highly pathological. This is lined up as chronic pathology which results as vitiation of body humours sufficient enough to direct the ongoing pathogenesis resulting into

congenital abnormalities which may be clinically conspicuous or not at the time of birth. *Ayurveda* explains the theory of three humours or “*Tridosha* theory” similar to the one suggested by Hippocrates in his concept of health and disease that matter is made up of 4 elements- Earth, Air, Fire and Water which were represented in body by 4 humours - Phlegm, Yellow bile, Blood and Black bile<sup>17</sup>. Similar body humours in *ayurveda* are responsible for the maintenance of healthy and diseased state namely: *Vata* (which is related to locomotor system, nervous system & all other movement related principles of body), *Pitta* (related to all type of metabolism which is involved in transformation of molecules and in conversion of various forms of energy), *Kapha* (related to the dense part of body composition which can be directly seen). Of which physiology and pathology of reproductive issues like twinning and congenital anomalies is chiefly governed by vitiation of *vata* humour<sup>21</sup>. Abnormalities of seminal fluid or gametes, as well as vitiated

*vata* located in *it* are also believed to produce congenital anomalies<sup>19</sup>.

These physiological principles called humours governs the physiology of both healthy and diseased condition in the body. *Vata* humour is stated to be responsible for twinning, ocular, spiral anomalies, still births, dwarfism and other dysmorphic congenital anomalies<sup>20</sup> of which twinning observation has substantiated this statement among kodinji population. If this principle is true, then we need to keep a constant vigilance in such areas regarding congenital issues as multiple births have been associated with increased birth defects than in singletons<sup>21</sup>.

In *ayurveda*, the status of these body humours is chiefly dependent on two factors – internal & external. Among them former factor is the body constitution/*prakriti* (which is an inborn quality of an individual and quality of this constitution is exclusively attributed by the status of body humours of both parents at the time of conception and by maternal humours during the course of pregnancy) and the later factors are external agents like food & environment which have inevitable influence in altering the natural state of humours after birth. In our study, we analysed the inherent constitution of those population & the food items consumed regularly which might have otherwise contributed for the vitiation of humours. A broad concept of *prakriti* in *ayurveda* is that it is formed at the time of conception with respect to predominance of one, two or all three body humours/*doshas*<sup>22</sup>. Accordingly such permutations and combinations (*vata-pitta*, *pitta-kapha*, *kapha-vata*, or *sama prakriti*) can be seen in individuals. This constitution is also influenced by further six factors out of which two factors food &

disorders were analysed for the current status of imbalanced humours.

Generally, a *vata* body type is more prone to get afflicted with nervous disorders and disturbances in secretions regulatory principles, *pitta* body type is prone to get afflicted with increased metabolic disorders and *kapha* body type to get obesogenic disorders. In this study we found a contrast of more *vata* disorders in *kapha* body constitution which is a paradox. *Ayurveda* has a beautiful answer for this situation. This *vata* aggravation is generally caused in 2 ways- either independent *vata* aggravation (IVA, where there is actual increase in its quantity), or dependent aggravation<sup>23</sup> (DVA, where aggravation is due to the reduced space for accommodation of normal amount of *vata*, which is secondary to the increased quantity of other two humours). As per this study, there is a DVA of *vata* humour in *kapha* & *pitta* body type & this can be substantiated by the nature of their food i-e *kapha* and *pitta* affluent food items (100% consumption of both *pitta* and *kapha* predominant food items by kodinji twin and non twin mothers).

So here, either IVA/DVA is contributing to produce MZ twins while aggravated *pitta* might have contributed for DZ twinning. These *vata* and *pitta* pathologies are either inherent by constitution/*prakriti* or might have been acquired through food and daily activities of living. Keeping this in mind, the status of morbid *doshas* shows that the mothers of twins at kodinji (K+) are suffering from predominantly *vata dosha* in comparison to other *doshas*. DVA might have happened on the basis of *kapha* and *pitta* aggravation. Another striking observation is the higher percentage of vitiation of all *doshas* among twin's mothers than non twin's mother at kodinji. Odds analysis reveals that each

*dosha* vitiation has a positive association with twinning but higher odds are seen with *vata dosha* followed by *kapha* and lastly by *pitta*.

Among kodinji people, predominance of *vata* in their constitution is noteworthy but that is not seen highest among the mothers of twins. So the *Prakriti* is not the soul factor but one among several factors determining twinning morbidity. *Prakriti* has a specific gene pool to produce *vata* morbidity especially when *vata* aggravating factors are present. That is why twins are more in mothers who are having twins in their 1<sup>st</sup> or 2<sup>nd</sup> degree relatives.

But how much diet might have contributed and influenced the status of morbid *doshas* to produce twinning can be understood by the gravity of type of food intake shown in the diet graph mentioned above. The morbid status of *vata dosha* might have produced by dependent way because kodinji people are consuming diet more of *kapha* and *pitta* type. So a dependent *vata dosha* is seen in maximum number of individuals.

In terms of modern parameters diet like coffee, alcohol, smoking etc. has been evidencing for increased risk of multiple pregnancy. In biological terms, explanations like lowering of oestrogen concentration, increasing pituitary gonadotrophins and ovarian stimulations etc. has been attributed to such type of diets<sup>24</sup> But in *ayurveda* coffee, alcohol and smoking all are said to increase *vata* and *pitta dosha*. Such food consumption directly vitiates either *vata* or *pitta dosha* in the body. If consumed in excess then this status might be sufficient enough to trigger the mechanisms underlying both MZ and DZ pregnancies.

In general increased *vata* is suggested to produce MZ twins as it

enhances the splitting of zygote and increased *pitta* is suggested to produce DZ twins by increasing the basal metabolism rate thus contributing to change in concentrations of hormones. This association has also been pointed by Martin Nicholas G. et al.1991, who found elevated levels of serum inhibin throughout the cycle in mothers of DZ twins. Also elevated were the early follicular FSH levels, LH levels throughout the follicular phase and early to midfollicular estradiol in DZ mothers, indicative of greater follicular activity<sup>25</sup>.

Our findings has also shown a positive association of twinning with increased BMI levels among Kodinji twin mothers compared to the non twin mothers and this association has been established by large number of studies<sup>7</sup>. Increase in body weight is a direct indicator of vitiated *vata* and *kapha dosha* as per ayurveda<sup>26</sup>. So almost all three *doshas* are vitiated significantly in kodinji twin mothers of which excess *vata* with *kapha* might be responsible for MZ twinning and excess *pitta* along with *kapha* might be producing DZ twinning. But in what proportion, these humours might have been vitiated and how they are interacting is a real challenge to *ayurveda* community. Since *ayurveda* along with clinical, also is a philosophical science describing the various meanings and styles of life in different aspects, so the interpretation of health and disease is based on deductive reasoning as morbidity of body tissues (*Dhatus*) in ayurveda depends on quality of *doshas* contributed through their lifestyles.

Nowadays there are sufficient evidences suggesting that epigenetic mechanisms may mediate the effect of nutrition and may be causal for the development of chronic diseases<sup>27</sup>. Numerous dietary factors including



micronutrients and non nutrient components can modify epigenetic marks which are responsible for altering gene expression not only during the cellular differentiation in embryonic and foetal development but also through lifecourse<sup>28</sup>. Thus when certain foods items which are vitiating body humours are consumed regularly for long time on traditional basis can have big hand in altering epigenetic mechanisms which are further inherited into their upcoming generations and thus share a common gene pool. This might be a reason for sudden increase in twinning rate at kodinji village after 1985 that made kodinji notified for twins.

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## CONCLUSION

According to *ayurveda* twinning is highly pathological and high frequency twinning is a great concern of public health problem as it is associated with many co-morbid conditions along with congenital anomalies theoretically. In kodinji, village of pronounced twinning in Kerala, food and phenotypical characterization called *Prakriti* and interaction between the two might have played a significant role in aggravating the 'web of causation' known for twinning so as to produce abnormally high frequency twins.

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