# Prevalence and Associate Factors for Striae Gravidarum

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***Objective:*** *To determine the prevalence and associate factors for striae gravidarum in Thai pregnant women*
***Study design:*** *Cross-sectional study*
***Material and Method:*** *Two hundred and eighty women who gave first birth and were admitted to the postpartum wards in Siriraj Hospital were recruited. All of them were assessed during the immediate postpartum period for having striae gravidarum or not by the physician. The questionnaire was used to interview the participants for all of the information needed in the present study. The participants with striae gravidarum and the other without striae gravidarum were compared to characteristics of women using unpaired student t test and Chi-square tests.*
***Results:*** *Seventy-seven percent of the study participants had developed striae gravidarum. Women who developed striae gravidarum were significantly younger (22.8 yr $\pm$ 4.0 yr vs. 26.6 yr $\pm$ 6.0 yr; $p < 0.05$), higher pre-pregnancy BMI (21.2 kg/m$^2$ $\pm$ 4.1 kg/m$^2$ vs. 19.8 kg/m$^2$ $\pm$ 4.8 kg/m$^2$; $p < 0.05$), higher maternal BMI at pregnancy (27.3 kg/m$^2$ $\pm$ 4.7 kg/m$^2$ vs. 25.6 kg/m$^2$ $\pm$ 6.0 kg/m$^2$; $p < 0.05$), higher gestational age at delivery (39.1wk $\pm$ 1.3wk vs. 38.6 wk $\pm$ 1.1 wk; $p < 0.05$), higher birth weight of baby (3,078.8 g $\pm$ 411.4g vs. 2,895.8g $\pm$ 339.2g; $p < 0.05$), alcoholic drinker (91.4% vs. 8.6%; $p < 0.05$), had a little water intake (7.4 glasses $\pm$ 2.7 glasses vs. 8.3 glasses $\pm$ 3.1 glasses; $p < 0.05$), and had a family history of striae gravidarum (82.8% vs. 17.2%; $p < 0.05$) were associated with striae gravidarum.*
***Conclusion:*** *Maternal age, pre- pregnancy BMI, maternal BMI at delivery, gestational age at delivery, birth weight of baby, alcoholic drinking, water intake and family history were associated with striae gravidarum.*

***Keyword:*** *Striae gravidarum, Striae, Associate factors, Prevalence, Stretch mark*

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Striae gravidarum is the alteration in skin appearance during pregnancy. Striae gravidarum is a linear lesion that occurs on the abdomen, breast, buttock, hip, and thighs. The colors rank from pink, red, to brown. It has been reported in the literature that the prevalence in the general population ranks from 50%-90% of pregnant women[1-3].

The cause of striae gravidarum remains unknown but clearly relates to changes in the structures that provide the skin with its tensile strength, elasticity, relate to the change of flexibility and reaction force of the collagen string of the skin[1,2,4,5]. Some studies show such alteration related to the varying of hormones during the pregnancy such as estrogen, relaxin and adrenocortical steroids[2,5]. Most striae gravidarum do not disappear after delivery, and overtime, lose pigmentation and atropty. Eventually, they appear as white scarlike lesions[1-3].

Even though, the striae gravidarum creates a very small health issue such as itching, burning, and emotional distress, but are mainly thought of as a cosmetic nuisance[1,3,5].

Several studies have been done in the past in an attempt to protect and manage striae gravidarum. The protection is by applying lotion, massaging by olive oil and taking a course of any skin treatment. As a consequence, the cure of striae gravidarum is much more like the protection methods. In addition, there is the use of laser to reduce the mark of striae gravidarum[1,2].

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At the moment, there is no effective protection method for striae gravidarum due to the authors not understanding the mechanism which really causes it[1,2,6].

Several studies have been done in the past in an attempt to determine the associated factors for striae gravidarum. These studies will lead us to know the associated factors for striae gravidarum. As a result, future studies may be directed at examining these factors to prevent and cure striae gravidarum with successful techniques.

From many literature reviews, there are some associated items or factors which create a chance for striae gravidarum as described later.

In a 2004 study, Chang et al, reported that the prevalence of striae gravidarum was fifty- five percent[3]. Many pregnant women developed striae gravidarum about ninety percent in the first trimester, the rest were during the second trimester. The mean gestational age for the onset of striae gravidarum was approximately 24.6 weeks. The present study suggested that a history of breast or thigh striae, family history, and race was significantly predictive of striae gravidarum development. On the other hand, the unrelated factors were pre-pregnancy body mass index and the increase of body mass index during pregnancy.

In a 2004 study, Thomas et al, reported that factors most associated with striae gravidarum were maternal body mass index, maternal age and baby weight centile[5]. The present study also found that young women had more striae. There were two possible explanations for this latter finding. It had been suggested that striae gravidarum were associated with poor nutrition and most of the young primigravida came from the poorer groups of the population who possibly had a less healthy diet.

In a 2006 study, Salter et al, reported that the prevalence of striae gravidarum was fifty to ninety percent. Many women experience striae gravidarum during their first pregnancy, The present study suggested that a family history and race were associated with striae gravidarum[1].

In a 2007 study, Osman et al, reported that the prevalence of striae gravidarum was sixty-one percent, most of them developed striae gravidarum on the abdomen[2]. The present study suggested that associate factors for striae gravidarum were maternal age, weight gained during pregnancy, gestational age and maternal body weight at delivery. On the other hand, no relationship was noted between skin type, socioeconomic status, smoking, skin cream usage, fetal gender or family history for developing striae gravidarum. However, women who had a family history of striae gravidarum were more likely to develop moderate/ severe striae gravidarum than those who had no family history of striae gravidarum.

From all above reasons, the authors were very interested to study the prevalence and associate factors for striae gravidarum, especially in Thai pregnant women. The result of the present study can help physicians counsel Thai pregnant women about their associated factors for striae gravidarum. However, there still has been no such type of study in Thailand, so the authors believe that skin type, genetics, race, body structure, lifestyle and environment of Thailand differ from other countries. In addition, the authors suspect that there are more associated factors to focus, especially factors for healthy skin, such as sleeping, food intake, water intake, bowel movement, exercise, sunlight or air condition exposure. The authors think, factors that affect healthy skin may be associated with striae gravidarum. Information from the present study can derive to counseling and promote health care for pregnant women, perhaps this information will lead to a better understanding of etiology of striae gravidarum as well as a possible preventive therapy or cure.

**Material and Method**

A cross-sectional study was carried out on 280 women who had term pregnancy and given first birth and that attended the postpartum wards of Siriraj Hospital, Bangkok, Thailand in September - October 2007, with the approval of the institutional ethic committee. The advertisements were conducted for seeking volunteers by poster. The volunteers who didn't have other skin lesions from diseases gave informed consent at the nurses' station of either postpartum wards. The questionnaire was used to interview the subjects about four categories during the immediate postpartum period (within 3 days). First was demographic data such as maternal age, race, skin color, pre-pregnancy BMI, environment at work, working time, smoking, alcoholic drinking and family history of striae gravidarum. Second was lifestyle data, such as skin cream usage, type of food intake especially vegetable or fruit, water intake, sleeping habit, exercise and bowel movement. Third was data of presentation of striae gravidarum that was evaluated by the physician that regarded the same criteria for definition of striae gravidarum[1]. Fourth was obstetric and delivery data, such as gestational age, maternal BMI at delivery, birth weight of baby and baby's sex.

The questionnaires instructed the subjects to place the anonymously completed questionnaires into the present study file. Statistical analyses involving two groups (with striae gravidarum and the other without striae gravidarum) were compared to characteristics of women using Chi-square analysis if variables were categorical, unpaired student *t*-tests if variables were continuous, and p-values (two-tailed) were performed using SPSS 13. Statistical significance was set at $p < 0.05$.

## Results

Of 280 women enrolled in the present study, the prevalence of striae gravidarum was 77.9%. 158 (56.4%) developed striae gravidarum on the abdomen, 126 (45%) developed striae gravidarum on the thighs, 117 (41.8%) developed striae gravidarum on the breasts and 112 (40%) developed striae gravidarum on the buttock.

Women who developed striae gravidarum were significantly younger, the mean maternal age with striae gravidarum was 22.82 years (SD = 5.03) and without striae gravidarum was 26.61 years (SD = 6.02), ($p < 0.05$). Women with striae gravidarum had significantly higher pre-pregnancy BMI ($21.23 \pm 4.13$ vs. $19.88 \pm 4.81$, $p < 0.05$), higher maternal BMI at delivery ($27.30 \pm 4.78$ vs. $25.63 \pm 6.09$, $p < 0.05$), higher birth weight of baby ($3,078.82 \pm 411.49$ vs. $2,895.82 \pm 339.27$, $p < 0.05$) and higher gestational age at delivery (39.1 wk $\pm$ 1.3 wk vs. 38.6 wk $\pm$ 1.1 wk; $p < 0.05$) than women without striae gravidarum (Table 1). Women with striae gravidarum had water intake significantly less than women without striae gravidarum ($7.45 \pm 2.74$ vs. $8.34 \pm 3.11$, $p < 0.05$). There were no statistically significant differences between women with and without striae gravidarum with respect to total weight gain during pregnancy and sleeping times (Table 1).

The predominant skin color in the presented population was yellow (54.3%). Most of the women were nonsmokers (98.2%) and no alcoholic drinking (87.5%). Most of the presented population was Thai race (99.6%). There were no statistically significant differences between women with and without striae gravidarum with respect to race, skin color, environment at work such as sunlight or air condition exposure, working time such as night-time or daytime, smoking, fetal gender, skin cream usage, fruit or vegetable intake, bowel movement and exercise (Table 2).

Almost half of the women with striae gravidarum (135/218) had mothers or sisters with striae gravidarum (82.8%); in contrast, only 17.2% without striae gravidarum (28/62) had mothers or sisters with striae gravidarum ($p < 0.05$). Women who developed striae gravidarum were significantly alcoholic drinkers (91.4% vs. 75.9%, $p < 0.05$) (Table 2).

## Discussion

The present study provides a clinical assessment of the prevalence and associated factors for striae gravidarum in the cross sectional study of racially homogeneous women at a single tertiary care referral center. This is one of the few studies in which striae gravidarum was evaluated by physicians. To the best of the authors' knowledge, the present study is the one of the few studies that physicians evaluated striae gravidarum on thighs, breast, buttock and not only on the abdomen as in previous studies.

The present finding that affected skin by striae gravidarum was also strongly on thighs, breast and

**Table 1.** Association of maternal characteristics and striae gravidarum; univariate analysis; student *t*-test

| Maternal characteristics | Presence of striae gravidarum | | |
|---|---|---|---|
| | Yes<br>Mean (SD) | No<br>Mean (SD) | p-value |
| Age (years) | 22.82 (5.03) | 26.61 (6.02) | 0.000* |
| Pre-pregnancy BMI ($kg/m^2$) | 21.23 (4.13) | 19.88 (4.81) | 0.029* |
| Gestational age at delivery (weeks) | 39.02 (1.31) | 38.61 (1.19) | 0.027* |
| BMI at delivery ($kg/m^2$) | 27.30 (4.78) | 25.63 (6.09) | 0.023* |
| Total weight gain (kg) | 15.06 (5.71) | 13.70 (5.21) | 0.093 |
| Birth weight of baby (g) | 3,078.82 (411.49) | 2,895.82 (339.27) | 0.027* |
| Water intake (glasses) | 7.45 (2.74) | 8.34 (3.11) | 0.031* |
| Sleeping time (hours) | 8.32 (1.68) | 8.13 (1.71) | 0.443 |

* Statistically significant

**Table 2.** Association of maternal characteristics and striae gravidarum; univariate analysis, Chi-square

| Maternal characteristics | Presence of striae gravidarum | | |
|---|---|---|---|
| | Yes n (%) | No n (%) | p-value |
| Race | | | |
| Thai | 218 (78.1) | 61 (21.9) | 0.060 |
| Chinese | 0 ( 0) | 1 ( 100) | |
| Skin colour | | | |
| White | 26 (74.3) | 9 (25.7) | 0.368 |
| Black | 77 (82.8) | 16 (17.2) | |
| Yellow | 115 (75.7) | 37 (24.3) | |
| Environment at work | | | |
| Sunlight | 29 (85.3) | 5 (14.7) | 0.163 |
| Room air | 133 (79.6) | 34 (20.4) | |
| Air condition | 56 (70.9) | 23 (29.1) | |
| Working time | | | |
| Daytime | 214 (77.8) | 61 (22.2) | 0.907 |
| Night-time | 4 (80.0) | 1 (20.0) | |
| Smoking | | | |
| None | 214 (77.8) | 61 (22.2) | 0.907 |
| Yes | 4 (80.0) | 1 (20) | |
| Alcoholic drinking | | | |
| None | 186 (75.9) | 59 (24.1) | 0.039 * |
| Yes | 32 (91.4) | 3 (8.6) | |
| Family history of striae gravidarum | | | |
| None | 83 (70.9) | 34 (29.1) | 0.018 * |
| Yes | 135 (82.8) | 28 (17.2) | |
| Baby's sex | | | |
| Male | 116 (77.9) | 33 (22.1) | 0.998 |
| Female | 102 (77.9) | 29 (22.1) | |
| Pre – pregnancy skin cream usage | | | |
| None | 58 (77.3) | 17 (22.7) | 0.898 |
| Yes | 160 (78.0) | 45 (22.0) | |
| Skin cream usage during pregnancy | | | |
| None | 56 (80.0) | 14 (20.0) | 0.618 |
| Yes | 162 (77.1) | 48 (22.9) | |
| Fruit or vegetable intake | | | |
| None | 0 | 0 | - |
| Yes | 218 (77.9) | 62 (22.1) | |
| Exercise | | | |
| None | 132 (77.6) | 38 (22.4) | 0.916 |
| Yes | 86 (78.2) | 24 (21.8) | |
| Bowel movement | | | |
| Normal | 177 (79.7) | 45 (20.3) | 0.140 |
| Constipation | 41 (70.7) | 17 (29.3) | |

buttock, commonly on abdomen and is the one of the few studies that focused on most of the factors associated for striae gravidarum, especially being the first study in Thailand.

The authors found that the prevalence of striae gravidarum was 77.9%, consistent with previous reports[1-3]. Surprisingly, the authors found that water intake was an associated factor for striae gravidarum. The authors assume that increasing water intake is enough for soaking the skin to improve flexibility and elasticity, because the previous study[1,2,4,5,7] suggested that striae gravidarum clearly relates to change

in structures that provide the skin with its tensile strength, elasticity, relate to the change of flexibility and reaction force of the collagen string of the skin. The authors believe that if the women have enough water intake, it can improve and prevent striae gravidarum but with a great understanding of this factor, effective future study for randomized controlled trials will be performed.

The younger women developed striae gravidarum more than the older women, this result is similar to a previous study[5], the authors think a much more likely explanation is that the connective tissue of the young women with more collagen and less cross-linking of collagen is more ready to undergo the partial tearing that occurs in response to the stretch associated with striae gravidarum formation.

Higher pre-pregnancy BMI, higher maternal BMI at delivery were significantly associated with striae gravidarum, the present finding is not consistent with previous reports[3]. With regard to definition of normal BMI is 18.5 to 24.9 kg/m$^2$; overweight is a BMI of 25 to 29.9 kg/m$^2$[8]. Although the mean of pre-pregnancy BMI with striae gravidarum and without striae gravidarum in the present study were within normal limit, pre-pregnancy BMI was significantly higher for those who developed striae gravidarum. Although the mean of maternal BMI at delivery with striae gravidarum and without striae gravidarum in the present study were overweight, maternal BMI at delivery was significantly higher for those who developed striae gravidarum. The authors assume that, in the fatty women or obesity, total skin collagen keeps pace with the over extension of the skin surface area by obesity. The authors think that more rapid weight gain during pregnancy is a more rapid stretch lead to mechanical response of stretch, tear or striae, and develop striae gravidarum[4].

Women with striae gravidarum significantly had a family history of striae gravidarum, especially mothers or sisters. This result is consistent with previous reports[3,4], and can explain that the quantitative setting of skin collagen is both individual and site-specific and the control of this is presumably genetic[4].

However, since the demographic factors of both groups (with striae gravidarum and without striae gravidarum) with respect to skin color and race are similar, this may not have been an important factor between the two groups.

Similar to a previous study[2], the authors found that higher gestational age at delivery was significantly associated with striae gravidarum. This factor is probably interrelated and is related to some extent to the degree of stretching of the skin[2].

The authors found that higher birth weight of the baby was significantly associated with striae gravidarum, the present finding is consistent with previous studies[5,9]. The other study suggested that occurrence of striae was the result of two main influences, one of these was the amount of stretch applied, which depend on the size of the gestational contents[5], particularly the baby. This previous study reported that higher striae scores are found in women with bigger babies[5].

The present study found that women who developed striae gravidarum were significantly alcoholic drinkers. To the best of the authors' knowledge, the authors' study is the only study that evaluated this factor, not studied in the past. The authors known that alcohol is harmful for pregnancy, but the mechanism of alcohol that affects striae gravidarum should be further studied.

Similar to the previous study[2], the authors found that other factors including smoking, fetal gender, skin cream usage are not significantly associated for striae gravidarum. However, the proportion of smokers in the present study was too small to show any difference with regard to striae gravidarum development.

Although sleeping time, sunlight exposure, air condition exposure, working time, fruit or vegetable intake, exercise and bowel movement are not significantly associated for striae gravidarum, this is the first study to look at other factors, not studied in the past, that may theoretically be associated for developing striae gravidarum.

In addition to, the present study was limited by less timing so that a better study for these should be a prospective observational study.

Pregnant women often ask information regarding their associated factors for striae gravidarum and means to prevent their appearance during their antenatal visits. The present findings can help physicians answer some of these questions when counseling patients about their associated factors for striae gravidarum. Although some of the factors associated with striae gravidarum are not modifiable (i.e., age, family history, birth weight of baby, gestational age at delivery), other factors such as pre-pregnancy BMI, maternal BMI at delivery, water intake and alcoholic drinking are modifiable factors. Future research should focus on preventive methods that may reduce the likelihood of striae gravidarum development. More specially, the prophylactic use of water intake should

be further investigated to determine once in the randomized controlled trials and for all if these preventive methods and treatments have any benefit.

**Conclusion**

The prevalence of striae gravidarum was 77.9%. The factors associated for striae gravidarum included maternal age, pre-pregnancy BMI, maternal BMI at delivery, gestational age at delivery, birth weight of baby, water intake, alcoholic drinking and family history.

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# ความชุกและปัจจัยสัมพันธ์ต่อการเกิดผิวหนังลายในสตรีตั้งครรภ์

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***วัตถุประสงค์:*** *เพื่อหาความชุกและปัจจัยสัมพันธ์ต่อการเกิดผิวหนังลายในสตรีไทยที่ตั้งครรภ์*

***วัสดุและวิธีการ:*** *ผู้สนใจเข้าร่วมศึกษาจำนวน 280 ราย ซึ่งเป็นสตรีที่คลอดบุตรครั้งแรกโดยพักฟื้นที่หอผู้ป่วยหลังคลอด โรงพยาบาลศิริราช และตรงตามเกณฑ์การคัดเลือกประชากรเข้าศึกษา ซึ่งผู้เข้าร่วมทุกรายได้รับการตรวจโดยแพทย์ว่ามีผิวหนังลายในขณะตั้งครรภ์หรือไม่ และได้ตอบแบบสอบถามให้ครบถ้วนตามที่ได้กำหนดไว้ในการศึกษานี้ จากนั้นทั้งกลุ่มที่มีผิวหนังลายขณะตั้งครรภ์ และกลุ่มที่ไม่มีผิวหนังลายขณะตั้งครรภ์ได้นำไปศึกษาเปรียบเทียบปัจจัยสัมพันธ์ต่อการเกิดผิวหนังลายในสตรีตั้งครรภ์ โดยใช้วิธีวิเคราะห์ทางสถิติ คือ Unpair Student t-test และ Chi-square test*

***ผลการศึกษา:*** *ความชุกของการเกิดผิวหนังลายในขณะตั้งครรภ์เท่ากับร้อยละ77.9 ผู้เข้าร่วมศึกษาที่มีผิวหนังลายในขณะตั้งครรภ์ได้แก่ มีอายุน้อยกว่า (22.8 ปี $\pm$ 5.3ปี และ 26.6 ปี $\pm$ 6.0 ปี; $p < 0.05$), มีดัชนีมวลกายก่อนตั้งครรภ์มากกว่า (21.2 กก./ม.$^2$ $\pm$ 4.1 กก./ม.$^2$ และ 19.8 กก./ม.$^2$ $\pm$ 4.8 กก./ม.$^2$; $p < 0.05$), มีดัชนีมวลกายเมื่อคลอดบุตรมากกว่า (27.3 กก./ม.$^2$ $\pm$ 4.7 กก./ม.$^2$ และ 25.6 กก./ม.$^2$ $\pm$ 6.0 กก./ม.$^2$; $p < 0.05$), มีอายุครรภ์ขณะคลอดบุตรมากกว่า (39.1 สัปดาห์ $\pm$ 1.3 สัปดาห์ และ 38.6 สัปดาห์ $\pm$ 1.1 สัปดาห์; $p < 0.05$), มีน้ำหนักทารกแรกเกิดมากกว่า (3,078.8 กรัม $\pm$ 411.4 กรัม และ 2,895.8 กรัม $\pm$ 339.2 กรัม; $p < 0.05$), ดื่มเหล้า (91.4% และ 8.6%; $p < 0.05$), ดื่มน้ำน้อยกว่า (7.4 แก้ว $\pm$ 2.7 แก้ว และ 8.3 แก้ว $\pm$ 3.1 แก้ว; $p < 0.05$) ประวัติครอบครัวมีผิวหนังลายในขณะตั้งครรภ์ (82.8% และ 17.2%; $p < 0.05$) โดยปัจจัยดังกล่าว มีความสัมพันธ์ต่อการเกิดผิวหนังลายในขณะตั้งครรภ์อย่างมีนัยสำคัญทางสถิติ*

***สรุป:*** *อายุของสตรีตั้งครรภ์, น้ำหนักที่เพิ่มขึ้นในสตรีตั้งครรภ์, ดัชนีมวลกายก่อนตั้งครรภ์, ดัชนีมวลกายขณะคลอดบุตร, อายุครรภ์ขณะคลอดบุตร, น้ำหนักทารกแรกเกิด, การดื่มเหล้า, การดื่มน้ำ และประวัติครอบครัวมีผิวหนังลายในขณะตั้งครรภ์ มีความสัมพันธ์ต่อการเกิดผิวหนังลายในขณะตั้งครรภ์*