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2 **Characteristics of socially high-risk pregnant women and children's outcomes**

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14 **Abstract**

1 **Background:** The number of reports of child abuse and neglect in Japan has increased  
2 each year. A causal relationship between socially high-risk pregnant women and child  
3 abuse is strongly suggested. This study aims to investigate the characteristics of  
4 socially high-risk pregnant women and their children's outcomes, to help prevent child  
5 abuse.

6 **Methods:** In total, 2,342 births were retrospectively analyzed from medical records. We  
7 extracted the frequency, factors, and circumstances of socially high-risk pregnant  
8 women, and the presence of social interventions for their children.

9 **Results:** There were 538 (23%) socially high-risk pregnant women out of 2,342 cases  
10 investigated. Related factors (with duplication) were: economic problems (258 cases,  
11 48%), mental disorders (139 cases, 26%) teenage pregnancies (112 cases, 21%), multiple  
12 pregnancies (90 cases, 17%), and pregnancy conflict (73 cases, 14%). Sixty-four (12%)  
13 expectant mothers received their first health examination in late pregnancy or were not  
14 receiving pregnancy health examinations. An analysis of births showed neonatal  
15 intensive care unit hospitalization in 40% of the children born to socially high-risk  
16 pregnant women. The hospital Child Abuse Prevention Committee intervened in 71

1 cases, and child consultation centers intervened in 55 cases. Twenty-two children  
2 entered social care facilities and four children died of unknown causes.

3 **Conclusions:** Socially high-risk pregnant women had various social and individual  
4 problems, and received multidisciplinary interventions for child rearing support.  
5 Antenatal assessment and multidisciplinary early intervention for socially high-risk  
6 pregnant women are necessary to prevent child abuse.

7

8 **Key words**

9 Socially high-risk pregnant women; socially high-risk; socioeconomic problems; child  
10 healthcare; child abuse

11

12

## 1 Introduction

2       Socially high-risk pregnant women are generally regarded as pregnant women who  
3 are expected to have difficulty with child rearing after childbirth.<sup>1</sup> Economic problems,  
4 teenage pregnancy, mental disorders, pregnancy conflict, and other factors may be  
5 associated with socially high-risk pregnant women.<sup>1,2</sup> However, no comprehensive  
6 definition of “socially high-risk” is available. Cooperation between medical institutions  
7 and health administration agencies before childbirth is necessary to support socially  
8 high-risk pregnant women and their children. However, little information is available  
9 regarding the characteristics of socially high-risk pregnant women and their children’s  
10 outcomes.

11       The number of reports of child abuse in Japan has increased each year, even though  
12 the neonatal mortality ratio has decreased. The highest number of cases was reported  
13 in 2016 (122,575 cases).<sup>3</sup> Seventy-seven children died following child abuse or forced  
14 double suicides during 2016.<sup>4</sup> Fifty percent of those children were dead within 1 month  
15 after birth, and in 61% of cases, the main perpetrator was the birth mother.<sup>4</sup> Therefore,  
16 it is important to identify and support socially high-risk pregnant women, especially

1 from early pregnancy. Economic distress, unintended pregnancy, pregnancy conflict,  
2 intimate partner violence, and mental disorders are regarded as risks for child abuse.<sup>5-7</sup>  
3 Children who are born to young mothers (i.e., teenagers) are at a high risk for being  
4 abused and neglected.<sup>8</sup> However, to the best of our knowledge, few studies have  
5 investigated the relationship between socially high-risk pregnant women and their  
6 children's outcomes.

7 It is important to investigate the characteristics of socially high-risk pregnant  
8 women and their children's outcomes in order to support child rearing and prevent child  
9 abuse from early in the pregnancy period. It is also necessary for regional health  
10 administration agencies and medical institutions to cooperate with socially high-risk  
11 pregnant women.

12 This study aims to investigate the characteristics of socially high-risk pregnant  
13 women during pregnancy and their children's outcomes in a local region. We also  
14 identify risk factors for cases where child abuse was suspected.

15

## 1 **Materials and methods**

2        This study enrolled all pregnant women at a medical institution (Aso Iizuka  
3    Hospital, Iizuka city, Fukuoka, Japan) between 2013 and 2016, from a medical  
4    population of 130,000 people. During that 4 years, there were about 4,600 births in this  
5    region, with 2,342 of these births at the study hospital. This medical institution has a  
6    perinatal medical center as well as managing normal deliveries, and receives many  
7    referral cases for medically high-risk pregnant women. It also has a psychiatry  
8    department and employs medical social workers in the obstetric and pediatric  
9    departments.

10       We retrospectively reviewed the medical records for 2,343 pregnant women and  
11    their children. First, we investigated the characteristics of socially high-risk pregnant  
12    women and the presence of social interventions for their children. In this study, socially  
13    high-risk pregnant women were tentatively defined as having one of seven high-risk  
14    factors, according to the guidelines for home-visit-support for child-rearing published by  
15    the Japanese Ministry of Health, Labour and Welfare.<sup>9</sup> The high-risk factors noted in  
16    this guideline are: teenage pregnancy, economic distress, mental disorders, pregnancy

1 conflict, pregnancy report to a public health center in late pregnancy, no pregnancy  
2 examination, and multiple pregnancy. In this survey, we defined economic problems as  
3 having received welfare protection and problems self-reported by the pregnant women.  
4 Pregnant women who had mental disorders were extracted based on specific conditions  
5 described in their medical record: a mental disorder diagnosed by a physician or  
6 self-reported by the pregnant woman, and a disorder documented following a screening  
7 interview with a public health nurse. In addition to these seven factors, we investigated  
8 the characteristics of socially high-risk pregnant women as described below.

9

#### 10 1. Socially high-risk factors of pregnant women

11 We retrospectively calculated the frequency of socially high-risk pregnant women  
12 who fulfilled the guideline criteria from the 2,343 births at Aso Iizuka Hospital. We also  
13 analyzed the frequency of each high-risk factor. We then investigated the socioeconomic,  
14 living environment, and lifestyle characteristics of the identified socially high-risk  
15 pregnant women. Some of these characteristics were considered high-risk factors,  
16 including: receiving welfare protection, single parent, mother's age, presence of physical



1 illness, pregnancy/family/marital history, experience of infertility treatment, lifestyle  
2 history (e.g., drinking alcohol and smoking), past experience of child abuse or intimate  
3 partner violence, type of medical insurance, and medical social worker interview history.

4 We excluded abortions and stillbirths.

5

6 2. Postnatal situation of children born to socially high-risk pregnant women

7 We investigated the postnatal situation of children. Data were extracted for  
8 children's gestational age, birth weight, presence of neonatal intensive care unit (NICU)  
9 hospitalization, and the status of the 1-month health checkup.

10

11 3. Definition of intervention and non-intervention groups

12 We investigated whether the children were cared for by child welfare facilities or  
13 had received an intervention from the Child Abuse Prevention Committee at the study  
14 hospital, child consultation offices, or the police. In Japan, the role of child welfare  
15 facilities is to nurture children in the facility that cannot live with their parents for

1 various reasons (e.g., maltreatment, economic problems, and loss of a parent). A  
2 hospital-based Child Abuse Prevention Committee manages cases who are admitted to  
3 hospital with injuries, physical illness, or behavioral problems, or when abuse is  
4 suspected. Child Consultation Offices are administrative organizations that assess and  
5 protect abused children based on notifications from the community, hospital, and police.  
6 The Abuse Prevention Committee in this study identified cases with suspected child  
7 abuse or possible development of child abuse using its own abuse check sheet. We also  
8 recorded the number of children who died from unreasonable causes. High-risk  
9 pregnant women whose children received an intervention were defined as the  
10 intervention group, with the remaining high-risk pregnant women defined as the  
11 non-intervention group. We used Fisher's chi-square test for comparisons between the  
12 groups. A *P*-value of <0.05 (95% confidence interval) was considered statistically  
13 significant. This retrospective study was approved by the Ethics Committee of Aso  
14 Iizuka Hospital (No. 15140).

15

16 **Results**

1 1. Seven factors of socially high-risk pregnant women

2 There were 538 (23%) socially high-risk pregnant women in the 2,342 cases  
3 analyzed (Fig. 1). The mean age of socially high-risk pregnant women was 28.5 years.

4 There were 258 cases (48%) of economic problems, 139 (26%) cases of mental disorders,  
5 112 cases (21%) of teenage pregnancies, 90 cases (17%) of multiple pregnancies, 73  
6 cases (14%) of pregnancy conflict, 52 cases (10%) women received their first health  
7 examination in late pregnancy, and 12 cases (2%) women were not undergoing  
8 pregnancy health examinations (Table 1).

9

10 2. Socioeconomic, living environment, and lifestyle characteristics of socially high-risk  
11 pregnant women

12 Among the 538 identified cases of socially high-risk pregnant women, there were  
13 332 cases (62%) involving a medical social worker, 214 cases (40%) of single parent  
14 family, and 169 cases (31%) that received welfare protection. Sixty-six (12%) women  
15 drank alcohol and 155 (29%) women smoked during pregnancy. In addition, 41

1 pregnant women (8%) had experienced domestic violence, 15 (3%) had experienced  
2 childhood abuse, 255 (47%) had underlying diseases, and 37 (7%) had sexually  
3 transmitted infections (e.g., chlamydia, neisseria gonorrhoeae, and syphilis). Advanced  
4 maternal age (over 35 years) at first birth was a factor in 35 cases (7%). Infertility  
5 treatment was recorded in 33 cases (6%), and 142 cases (26%) had a history of  
6 hospitalization because of threatened premature delivery (Table 2).

7

### 8 3. Postnatal situation of children born to socially high-risk pregnant women

9 The average gestational age of children born to socially high-risk pregnant women  
10 was 38 weeks, and the average birth weight was 2,660 g. NICU hospitalization was  
11 recorded for 40% of these children (Table 3). Reasons for hospitalization included  
12 premature delivery, low birth weight infant, fetal distress, and dyspnea. In addition,  
13 only 103 cases had breast milk nutrition at the time of the 1-month health checkup.

14

### 15 4. Number of children that received interventions during the perinatal period

1           The Child Abuse Prevention Committee intervened in 71 cases (13%), and child  
2   consultation centers intervened in 55 cases (10%). Twenty-two children entered social  
3   care facilities and four children died of unknown causes (Table 3). In the cases of death,  
4   the mother's age was 20, 29, 30, and 41 years, respectively; all four women had  
5   economic problems and three were single-parent families. Three mothers had  
6   pregnancy conflicts and two mothers had used illegal drugs. Children with unknown  
7   causes of death were suspected of having received maltreatment, and autopsies were  
8   performed in three cases. Some children received interventions from both the  
9   Committee and a consultation center; therefore, there were 93 cases of children that  
10   received interventions and 445 cases that did not (Fig. 1). In the intervention group,  
11   almost all cases were strongly suspected child abuse and neglect. Interviews by medical  
12   social workers occurred in all cases of death, in cooperation with health administration  
13   agencies.

14

15   5. Comparison of socially high-risk pregnant women in the intervention and  
16   non-intervention groups

1           The mean age of women in the intervention group was 26.3 years and that in the  
2 non-intervention group was 28.5 years. Evaluation of socioeconomic, living environment,  
3 and lifestyle characteristics showed significant differences between the intervention  
4 and non-intervention groups in economic problems, multiple pregnancy, pregnancy  
5 conflict, first health examination in late pregnancy, no pregnancy examination, and  
6 (Table 4). In addition, there were significant differences between the groups in: single  
7 parent families, receiving welfare protection, smoking, drinking alcohol, experience of  
8 domestic violence, past history of childhood abuse, medical social worker interviews,  
9 maternal underlying diseases, sexually transmitted infections, infertility treatment,  
10 incarceration history (women's/partner's), illegal drug use (Table 5).

11

## 12 **Discussion**

13           This study showed there was a high frequency of socially high-risk pregnant women  
14 in the study area (population size of 130,000 people) over the 4-year study period. Our  
15 investigation revealed that high-risk pregnant women in the intervention group showed

1 significantly higher frequencies of some socioeconomic, living environment, and lifestyle  
2 problems. The children of these women were strongly suspected of being abused.

3 In this study, socially high-risk pregnant women, especially those in the  
4 intervention group, had various socioeconomic, pregnant conflict, and late or less  
5 antenatal care visit. In addition, there were significant differences in the rate of  
6 drinking alcohol, smoking, illegal drug use, maternal underlying diseases and sexually  
7 transmitted diseases in the intervention group, indicating that medical risk was also  
8 higher among socially high-risk pregnant women. Maternal smoking, alcohol drinking,  
9 and substance use during pregnancy are associated with an increased risk for  
10 premature delivery, low birth weight, and fetal growth restriction.<sup>10-12</sup> Conversely, there  
11 was a lower frequency of infertility treatment in the intervention group, which might  
12 have reflected more economic problems in this group. Furthermore, abuse experienced  
13 in childhood and domestic violence were also significantly higher in the intervention  
14 group than in the non-intervention group. A previous study reported that children of  
15 mothers who had survived sexual or physical abuse by a parent or caregiver were  
16 significantly more likely to be maltreated than children of mothers who had not

1 experienced abuse.<sup>13</sup> Such characteristics in socially high-risk pregnant women may  
2 result in adverse medical, developmental, and emotional outcomes for their children.  
3 Therefore, antenatal assessment and multidisciplinary early intervention for socially  
4 high-risk pregnant women are necessary, especially during early pregnancy.

5 The definition of socially high-risk pregnant women was based on Japanese  
6 Ministry of Health, Labour and Welfare guideline criteria. However, definitions based  
7 on these guidelines are not consistent, as regional maternal and child health services  
8 establish their own definitions. In our study, the frequency of socially high-risk  
9 pregnant women meeting the Ministry of Health, Labour and Welfare criteria was high  
10 (23% of total births). Half of the socially high-risk pregnant women in this study  
11 experienced economic distress, which was verified by receiving public income support.  
12 In contrast, Mitsuda et al. reported that the proportion of socially high-risk pregnant  
13 women at medical institutions in Osaka prefecture was 8.7% in 2014 and 8.7% in 2015.<sup>1</sup>  
14 However, the definition of socially high-risk pregnant women was not explicitly stated  
15 in that study. In another study, 60 of 668 deliveries (11%) were judged to be cases of  
16 socially high-risk pregnant women,<sup>2</sup> with 28 cases related to economic distress, 29 cases



1 of mental disorders, and 13 cases that did not have pregnancy health examinations.

2 Another report identified 28 cases (14%) of socially high-risk pregnant women (seven

3 cases of teenage pregnancies, 10 cases of mental disorders, and 11 cases not yet entered

4 at birth) out of 194 deliveries in one year.<sup>14</sup> The possible explanation for the different

5 frequencies of socially high-risk pregnant women in these studies may depend on the

6 number of risk factors that were set in each regional maternal and child health service.

7 For example, if there are many risk factors included in the criteria, the frequency of

8 socially high-risk pregnant women is likely to increase. Furthermore, as some factors

9 (e.g., economic distress and pregnancy conflict) are subjective evaluations compared

10 with objective evaluations (e.g., multiple pregnancy, teenage pregnancy, and pregnancy

11 not yet consulted), health providers' decisions regarding inclusion of these factors may

12 lead to different judgments. Furthermore, selection bias related to the facilities might

13 have affected the frequencies. For example, the frequency of maternal mental illness

14 among socially high-risk pregnant women differed among different studies, with reports

15 of 46.7%<sup>2</sup> and 35.7%,<sup>14</sup> compared with the 26% in our study. We suggest that criteria for

16 investigation at a national administration level are needed, as well as criteria for

1 application at a regional level. This is because there are no studies on the incidence of  
2 socially high-risk pregnant women based on nationwide surveillance, as well as regional  
3 disparities in birth rates, maternal and perinatal mortality rates, and smoking  
4 rates.<sup>3,15-17</sup>

5 A significant research question was whether socially high-risk pregnant women  
6 were associated with the risk for child abuse. In our study, 93 cases received an  
7 intervention from the Child Abuse Prevention Committee, child consultation offices, or  
8 the police because of suspected child abuse or possible development of child abuse. Child  
9 abuse and neglect were suspected in almost all cases in the intervention group.  
10 However, it was difficult to determine exactly how many types of child abuse and the  
11 frequency of such abuse based on standard judgment, as we retrospectively obtained  
12 data from medical records. Previous literature cited common factors associated with  
13 socially high-risk pregnant women and child abuse risk. Poverty, low-income, and  
14 pregnancy conflict are regarded as some of the earliest identifiable risk-factors for child  
15 maltreatment.<sup>4,5</sup> A cross-sectional descriptive study stated that past mental illness,  
16 previous experience of intimate partner violence, and having a partner who was

1 unemployed were also associated with child abuse and neglect.<sup>7</sup> Another survey showed  
2 that juvenile pregnancy, maternal mental disorders, late first visit for pregnancy  
3 medical examination, age difference in a couple, and unregistered marriages were  
4 strongly connected with child abuse.<sup>1</sup> These reports may suggest a significant  
5 relationship between socially high-risk pregnant women and subsequent child abuse;  
6 however, further research with a control study design is needed.

7       Among the 538 socially high-risk pregnant women in our study, there were four  
8 cases of child death in which abuse was suspected, despite intervention by medical  
9 social workers and cooperation with community health nurses. This suggests it is  
10 necessary to reconsider how antenatal and postnatal health services are provided for  
11 socially high-risk pregnant women and their children. For example, in Finland, almost  
12 the entire pregnant population (99.8%) attends easily accessible antenatal care that is  
13 provided free of charge by the state.<sup>18</sup> This free antenatal care has been associated with  
14 fewer neonatal deaths.<sup>18</sup> Further, a single public health nurse in Finland manages a  
15 family in pregnancy and during child-rearing, which also contributes to reduced child  
16 maltreatment deaths.<sup>19</sup> In Baltimore, a federal family planning program has focused on

1 improving the general health of women along with non-reproductive health services,  
2 including general medical screening, smoking cessation, counseling (nutrition,  
3 depression, violence, substance abuse), and vaccination.<sup>20</sup> These non-reproductive  
4 health services are mainly provided to low income or uninsured people, and are  
5 expected to reduce their risk for adverse pregnancy outcomes.

6       There were several limitations in this study. First, this study was a retrospective  
7 investigation based on medical records; therefore, insufficient information might have  
8 been included if the original descriptions were incomplete. Second, several factors such  
9 as economic distress, pregnancy conflict, and abuse experience were based on  
10 non-standardized self-declaration, and there is a possibility that the reported  
11 frequencies are underestimated. Furthermore, there is a possibility that cases involving  
12 changes in residence may not be accurately included in the children's outcomes.  
13 Prospective observation is necessary to clarify the relationships between socially  
14 high-risk pregnant women's characteristics and their children's outcomes.

15       In conclusion, we determined the frequency of socially high-risk pregnant women,  
16 and investigated relationships among these women's socioeconomic, living environment,

1 and individual lifestyle problems and children's outcomes. Based on recorded suspicion  
2 of child abuse, the intervention group showed significantly higher frequencies of these  
3 problems than the non-intervention group. To minimize perinatal risks for socially  
4 high-risk pregnant women, interventions must begin in the early stages of pregnancy. It  
5 is expected that the maternal and child health information reported in this study could  
6 be beneficial for multidisciplinary cooperation to prevent child abuse.

7

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14

## 15 **Disclosure**

1 The authors declare no conflict of interest.

2

### 3 **Authors' contribution**

4 S.S. and S.N. contributed to the conception and design of this study. S.S. collected and  
5 analyzed data. H.K. performed the statistical analysis. S.S. and S.N. drafted the  
6 manuscript, and H.K., Y.O., Z.Y., and Y.Y. critically reviewed the manuscript and  
7 supervised the whole study process. All authors read and approved the final  
8 manuscript.

9

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8

9 **Figure legends**

10 Figure 1.

11 Flow diagram for this study. The frequency of socially high-risk pregnant women in Aso  
12 Iizuka Hospital (Fukuoka, Japan) from 2013 to 2016. The number of children that  
13 received an intervention during the perinatal period.

14

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16

1 Table 1. Seven factors of socially high-risk pregnant women

2	Factors (with duplication)	n (%)
3		n=538
4	Economic problems	258 (48)
5	Mental disorders	139 (26)
6	Teenage pregnancy	112 (21)
7	Multiple pregnancy	90 (17)
8	Pregnancy conflict	73 (14)
9	First health examination in late pregnancy	52 (10)
10	Not undergoing pregnancy health examination	2 (0.4)

11

12 Table 2. Socioeconomic, living environment, and lifestyle characteristics of socially high-risk  
13 pregnant women

14	Factors (with duplication)	n (%)
15		n=538
16	Single parent family	214 (40)
17	Receiving welfare protection	169 (31)
18	Smoking	155 (29)
19	Drinking alcohol	66 (12)
20	Intimate partner violence	41 (8)
21	Abuse experienced in childhood	15 (3)
22	The advanced maternal age at first birth (over 35 years old)	35 (7)
23	Medical social worker interview	332 (62)
24	Maternal underlying diseases	255 (47)
25	Sexually transmitted infections	37 (7)
26	Infertility treatment	33 (6)
27	Hospitalization for threatened premature delivery	142 (26)

28

29

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1 Table 3. Postnatal situation of children of socially high-risk pregnant women

2 Outcome (with duplication)	n (%)
3	n=538
4 NICU hospitalization	215 (40)
5 Intervention by Child Abuse Prevention Committee	71 (13)
6 Intervention by child consultation centers	55 (10)
7 Entered a child welfare facility	22 (4)
8 Intervention by police	19 (4)
9 Death from unknown cause	4 (0.7)
10 NICU, neonatal intensive care unit.	

11

12 Table 4. Comparison of factors associated with socially high-risk pregnant women in the  
13 intervention and non-intervention groups

14 Factors (with duplication)	Intervention group, n (%)	Non-intervention group, n (%)	<i>p</i> -value
15	n=93	n=445	
16 Economic problems	66 (71)	192 (43)	<0.001
17 Mental disorders	26 (28)	113 (26)	0.604
18 Teenage pregnancy	26 (28)	86 (19)	0.069
19 Multiple pregnancy	2 (2)	88 (20)	<0.001
20 Pregnancy conflict	25 (27)	48 (11)	<0.001
21 First health examination in late pregnancy	18 (19)	34 (9)	<0.01
22 Not undergoing pregnancy health examination	5 (5)	7 (8)	<0.05

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1 Table 5. Comparison of socioeconomic, living environment, and lifestyle factors in the intervention  
 2 and non-intervention groups

3	Factors (with duplication)	Intervention group, n (%)	Non-intervention group, n (%)	<i>p</i> -value
4		n=93	n=445	
5	Single parent family	60 (65)	54 (35)	<0.001
6	Receiving welfare protection	46 (50)	123 (28)	<0.001
7	Smoking	38 (41)	117 (26)	<0.01
8	Drinking alcohol	18 (19)	48 (11)	<0.05
9	Intimate partner violence	24 (26)	17 (4)	<0.001
10	Abuse experienced in childhood	9 (10)	6 (1)	<0.001
11	The advanced maternal age			
12	at first birth (over 35 years old)	3 (3)	32 (7)	0.245
13	Medical social worker interview	89 (96)	243 (55)	<0.001
14	Breast milk only	14 (15)	89 (20)	0.312
15	Maternal underlying diseases	61 (65)	194 (45)	<0.001
16	Sexually transmitted infections	12 (13)	25 (6)	<0.05
17	Infertility treatment	1 (1)	32 (7)	<0.05
18	Hospitalization for threatened premature delivery	18 (19)	124 (28)	0.094
19	Incarceration history (women's/partner's)	9 (10)	4 (0.9)	<0.001
20	Illegal drug use	8 (9)	2 (0.4)	<0.001
21	NICU hospitalization	42 (45)	173 (39)	0.295

22 NICU, neonatal intensive care unit.

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