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# A longitudinal study of post traumatic stress disorder (PTSD) and depression after tsunami in Thai children

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## Abstract

**Objective** The purposes of this study were to assess the prevalence trend of post traumatic stress disorder (PTSD) and depression among tsunami affecting Thai children and to identify factors associated with PTSD and depression in this group.

**Materials and methods** This study was population-based longitudinal study. Three mental health assessments were conducted among 7 to 14 year old children at 2, 9 months and 3 years post-tsunami. There were 210 affected children in Phang Nga province were enrolled in the follow-up study. Symptoms of PTSD and depression were assessed by using the UCLA PTSD Reaction Index and the Birleson Depression Self-rating Scale respectively.

**Results** There were 151 and 115 affected children in Phang Nga province were enrolled in the follow-up survey at 9 months and three years after tsunami respectively. Prevalence of PTSD among the children decreased from 12.4% (26/210) at two month post tsunami to 5.2% (6/115) at three years after tsunami. Prevalence of depression among the children decreased from 13.3% (28/210) at two month post tsunami to 6.1% (7/115) at three years after tsunami. Risk factors for mental health problems in this study were traumatic experiences and perception of threat or delayed evacuation during/ after the tsunami for PTSD and depression.

**Conclusion** PTSD and depression among tsunami affected Thai children decreased over time. Traumatic experiences and perception of threat or delayed evacuation during/ after the tsunami were associated with PTSD and depression.

**Key words :** children, depression, disaster, prevalence, PTSD

Advisory Group, Department of Mental Health

# การศึกษาระยะยาวของภาวะความเครียดหลังเหตุการณ์สะเทือนขวัญและซึมเศร้าของเด็กไทยที่ได้รับผลกระทบจากสึนามิ

เบญจพร ปัญญายง, พ.บ.


## บทคัดย่อ

**วัตถุประสงค์** เพื่อศึกษาแนวโน้มความชุกของภาวะความเครียดหลังเหตุการณ์สะเทือนขวัญ (post traumatic stress disorder : PTSD) และภาวะซึมเศร้าในเด็กไทยที่ได้รับผลกระทบจากสึนามิและปัจจัยที่สัมพันธ์กับ PTSD และภาวะซึมเศร้าในเด็กกลุ่มนี้

**วัสดุและวิธีการ** การศึกษานี้เป็นงานวิจัยประชากรระยะยาว โดยการสุ่มครัวเรือนการประเมินสุขภาพจิตเด็กอายุ 7-14 ปี จำนวน 3 ครั้ง เมื่อ 2, 9 เดือน และ 3 ปี ภายหลังสึนามิ ในการประเมินสุขภาพจิตครั้งแรก เด็กจำนวน 210 คนจาก 371 คนอาศัยอยู่ในจังหวัดพังงาและได้กำหนดเป็นกลุ่มตัวอย่างในการศึกษาติดตาม โดยใช้เครื่องมือ UCLA PTSD Reaction Index เพื่อประเมินโรค PTSD และ Birleson Depression Self-rating Scale เพื่อประเมินภาวะซึมเศร้า

**ผล** เด็กที่ได้รับผลกระทบจากสึนามิจำนวน 151 คนและ 115 คน ในจังหวัดพังงาได้รับการประเมินสุขภาพจิตเพื่อศึกษาติดตามเมื่อ 9 เดือนและ 3 ปีภายหลังสึนามิ พบว่า ความชุกของ PTSD ลดลงจากร้อยละ 12.4 (26/210) เมื่อ 2 เดือนภายหลังสึนามิ เป็นร้อยละ 5.2 (6/115) เมื่อ 3 ปีภายหลังสึนามิ ส่วนภาวะซึมเศร้าลดลงจากร้อยละ 13.3 (28/210) เมื่อ 2 เดือนภายหลังสึนามิ เป็นร้อยละ 6.1 (7/115) เมื่อ 3 ปีภายหลังสึนามิ ปัจจัยเสี่ยงต่อปัญหาสุขภาพจิต คือ ประสบการณ์ที่เกิดบาดแผลทางใจและการรับรู้ภัยคุกคามหรือการช่วยเหลืออพยพล่าช้าขณะเกิดหรือภายหลังสึนามิสัมพันธ์กับ PTSD และภาวะซึมเศร้า

**สรุป** ความชุกของ PTSD และภาวะซึมเศร้าในเด็กไทยที่ได้รับผลกระทบจากสึนามิ ลดลงเมื่อเวลาผ่านไป ประสบการณ์ที่เกิดบาดแผลทางใจและการรับรู้ภัยคุกคามหรือการช่วยเหลืออพยพล่าช้าขณะเกิดหรือภายหลังสึนามิสัมพันธ์กับ PTSD และภาวะซึมเศร้า ผลการศึกษามีส่วนสำคัญให้ผู้ที่เกี่ยวข้องตระหนักถึงการช่วยเหลือด้านจิตใจระยะยาวในระยะฟื้นฟูภายหลังภัยพิบัติเพื่อสุขภาพจิตที่ดีของผู้ประสบภัย


**คำสำคัญ :** เด็ก ภาวะซึมเศร้า ภัยพิบัติ ความชุก PTSD

กลุ่มที่ปรึกษากรมสุขภาพจิต

## Introduction

On 26 December, 2004, Asian tsunami hit 6 coastal provinces in the South of Thailand. It was estimated that approximately 1,460 were orphans and 12,000 families were affected as a result of the death or injury of family members, or loss of important belongings[1,2]

Asian tsunami, like other disaster, induced a global sorrow and was followed by specific psychological effects, such as, psychological distress, anxiety, depression, and post traumatic stress disorder (PTSD)[3-7]. WHO projection for mental health problems at 12 months after a disaster, suggested prevalence rates of mild to moderate mental disorder in general population at 20% and with a reduction to 15% through natural recovery without intervention, and severe disorder at 3-4%[8]. A follow-up study had estimated that 40% of cases had persisted symptoms at 1 year and declined to 20% to 30% by 5 years[9]. It is reflected that psychological needs of affected people vary overtime, and support has to be provided accordingly.

A number of studies have demonstrated the role of proximity in trauma response and dose response relationship between exposure and symptomatology[10,11]. Studies in Armenia, using child PTSD Reaction Index at 1.5 and 3 years after the 1988 Spitak Earthquake, indicated that extreme disaster-related trauma experiences have been associated with severe and prolonged post traumatic stress and depressive reactions among adolescents[12]. Traumatized children are commonly exposed to stressors in multiple ways, yet few studies have examined the relative impact or interactions among various forms of exposures. Moreover, perception of disaster also had an effect on child mental health[13,14].

Few population-based longitudinal studies were conducted in large-scale population and mostly not extended beyond one follow-up[15]. There were follow-up studies among tsunami affected children in Thailand in the same schools, but there were not population-based studies[16]. The present study was one of population-based longitudinal studies of mental health problems among affected children and adolescents after natural disaster in Thailand.

The objective of the present study was to assess the prevalence trend of PTSD and depression among tsunami affected children and to identify factors associated with PTSD and depression among tsunami affected children.

## Materials and methods

The present study was a population-based longitudinal study of mental health problems among children who affected by Asian tsunami 2004. Two of three mental health assessments were conducted among adults and children in tsunami affected provinces at 2 and 9 months post-tsunami in February and September 2005 by

the collaborative team of The Department of Mental Health (DMH) of the Royal Thai Government and Thailand Ministry of Public Health – US Centers for Disease Control and Prevention Collaboration (TUC). The third assessment was conducted by the DMH in February, 2008, 3 years post-tsunami. The sample size calculation and sampling methods were explained elsewhere[17,18]. In summary, the sample size was calculated on the basis of estimated prevalence of mental health problems of 5%, with an accuracy of 95% (+/-4%) and design effect of 1.5. For the first assessment, the sample of children aged 7 to 14 years was selected by a multistage cluster household sampling from 10 out of 16 shelters, 16 villages in Phang Nga, and 16 villages in Phuket and Krabi. There were 150 households from Phang Nga and 200 households from Krabi and Phuket were needed. The sample recruited 371 children: 167 displaced in the temporary shelters, 99 not displaced from tsunami affected villages and 105 not displaced from unaffected villages in Phang Nga, Phuket, and Krabi. Because Phang Nga province was serious affected by tsunami. All of affected children (210) in Phang Nga province of the first assessment was aimed to follow-up in the second and the third surveys.

## Instruments and data collection

In summary, the child version of the University of California, Los Angeles PTSD Reaction Index was used to assess symptoms of PTSD. The questionnaire contains 20 yes/no items, with a 4-point scale to measure the range of affirmative responses, ranging from 1 to 4. A child with score higher than 40 was classified as having PTSD[18-20].

The Birleson Depression Self-rating Scale was used to evaluate depression. The questionnaire contains 18 items rating the frequency of depressive symptoms over the previous week on a 3-points scale (most of the time, sometimes, never), a child who had a score of 15 or higher was defined as having depression[21].

A tsunami-modified version of the PsySTART Rapid Triage System which composed of 13 yes/no questions was used to evaluate tsunami-specific traumatic experiences. The questions included having seen tsunami waves, having seen anyone dead or injured, having heard screams, having had a delayed evacuation, having felt one's own or a family member's life to have been in danger, having felt unable to escape, having felt extreme panic or fear, having lost a close family member or friend, having had a close family member or friend injured, having lost home or important belongings, oneself got hurt and parents got hurt.

The study proposal was submitted, reviewed, and officially authorized by the ethic committee of Department of Mental Health, Ministry of Public Health before conducting

the survey (Reference number 21/2551). Data collection consisted of face-to-face interviews carried out in a temporary housing structure, a home, or a school. The children were interviewed by mental health professionals from DMH. Children in need of mental health support were referred to mental health services available both in temporary shelters and in community areas. First assessment was conducted from February 15th to February 22nd, 2005 in Phang Nga, Phuket and Krabi provinces. According to high prevalence rate of mental health problems among affected people in Phang Nga in the first assessment, the second assessment was conducted in the same population only in Phang Nga province from September 7th to 12th, 2005 (9 months after tsunami). The third assessment was conducted from February 11th and 18th, 2008 (3 years after tsunami) by DMH. All parents or guardians and children in this study were asked for verbal informed consent. Children who lost their homes or home damaged and lived in the temporary shelters were defined as displaced children.

## Data analysis

The prevalence of PTSD and depression and their risk factors were calculated and analyzed. The authors used descriptive statistics to summarize the demographic data and traumatic experiences. Logistic regression analysis backward stepwise, adjusted for confounding variables, was used to identify independent risk factors for PTSD and depression. A p-value of .05 was considered as significant. Odd ratio (OR) with 95% confidence interval (CI) were calculated. Risk factors for PTSD and depression included sex, age, education, religious, and tsunami-specific traumatic experiences (13 items) were entered in regression model.

## Results

**Characteristics:** In the first assessment, 210 of 371 total enrolled children lived in Phang Nga. 151 of 210 affected children (71.9%) in Phang Nga were follow up in the second assessment and 115 of 151 (76.2% of affected children from the second assessment) were follow up in third assessment respectively. The first assessment, 54.3% were female, 91.4% were Buddhist, 99.6% were studying, their mean age was 10.3 years (SD=2.1), 2.9% lost both parents, and most of them was displaced in temporary shelters. One fourth of the affected children in Phang Nga were still living in the temporary shelters when the second assessment was conducted nine months post-tsunami. No displaced children were in temporary shelters at 3 years after tsunami.

## Subjective and objective experiences of disaster

Affected children in Phang Nga had the most objective exposure such as: lost their family members and/or closed friends, lost important belongings, and saw tsunami wave. The most subjective experiences were feeling extreme panic or fear, feeling one's own or family member's life to have been in danger, and feeling unable to escape respectively. Suicidal ideation that occurred most of the time decreased from 7.1% (1st assessment) to 1.7% (3rd assessment) (Table 1)

**Table 1** Characteristics of affected children in Phang Nga Province

| Characteristics | | Number (%) | | |
|---|---|---|---|---|
| | | 1st survey (n=210) | 2nd survey (n=151) | 3rd survey (n=115) |
| religion | buddhism | 192 (91.4) | 143 (94.7) | 106 (92.2) |
| | others | 18 (8.6) | 8 (5.3) | 9 (7.8) |
| education | no | 1 (0.5) | 4 (2.7) | 3 (2.6) |
| | grade 1-6 | 134 (63.8) | 118 (78.1) | 54 (47.0) |
| | >grade 6 | 75 (35.7) | 29 (19.2) | 58 (50.4) |
| living conditions | | | | |
| displaced and living with parents & families | | 167 (79.5) | 38 (25.2) | 0 (0) |
| lost one parents | | 11 (5.2) | 5 (3.3) | 6 (5.2) |
| lost both parents | | 6 (2.9) | 5 (3.3) | 4 (3.5) |
| school damage | | 73 (34.8) | 64 (42.4) | 59 (51.3) |
| suicide ideation | | 30 (14.3) | 24 (15.9) | 11 (9.5) |
| tsunami related experiences | | | | |
| lost their family members and/or closed friends | | 164 (78.1) | 118 (78.1) | 94 (81.7) |
| lost important belongings | | 160 (76.2) | 118 (76.2) | 79 68.7) |
| saw tsunami wave | | 136 (64.8) | 95 (62.9) | 74 (64.3) |
| family member or closed friend got injured | | 122 (58.1) | 88 (58.3) | 62 (53.9) |
| saw dead body | | 97 (46.2) | 80 (53.0) | 69 (60.0) |
| heard screams | | 84 (40.0) | 75 (49.7) | 68 (59.1) |
| saw anyone dead or injured | | 113 (53.8) | 75 (49.7) | 56 (48.7) |
| parent got hurt | | 63 (30.0) | 28 (18.5) | 16 (13.9) |
| oneself got hurt | | 42 (20.0) | 41 (27.2) | 27 (23.5) |
| felt extreme panic or fear | | 113 (53.8) | 115 (76.2) | 91 (79.1) |
| felt one's own or family member's life have been in danger | | 147 (70.0) | 106 (70.2) | 80 (69.6) |
| felt unable to escape | | 115 (54.8) | 79 (52.3) | 66 (57.4) |
| felt delayed evacuation | | 57 (27.1) | 43 (28.5) | 42 (36.5) |

## Prevalence of PTSD at 2 months, 9 months and 3 years.

The prevalence of PTSD among affected children in Phang Nga were 12.4% in the first assessment, 10.6% in the second assessment, and 5.2% in the third assessment respectively. The prevalence of depression was 13.3% in the first assessment, 8.6% in the second assessment, and 6.1% in the third assessment respectively (Table 2). Suicidal ideation among children with depression was 42.9% (9/26) in the first assessment, 53.8% (7/13) in the second assessment, and 71.4% (5/7) in the third assessment respectively. Suicidal ideation among individuals with PTSD was 23.1% (6/26) in the first assessment, 30.8% (4/13) in the second assessment, and 50.0% (3/6) in the third assessment respectively. In the first assessment, the co-morbidity of depression among PTSD was 34.6% (9/26). One third of depressive children had PTSD.

**Table 2** Prevalence of PTSD and depression in affected children in the 1st, 2nd and 3rd surveys

| disorders | | number (%) | | |
|---|---|---|---|---|
| | | 1st survey (n=210) | 2nd survey (n=151) | 3rd survey (n=115) |
| PTSD | | 26 (12.4) | 16 (10.6) | 6 (5.2) |
| | boys | 10 (10.4) | 5 (7.0) | 3 (6.3) |
| | girls | 16 (14.0) | 11 (13.8) | 3 (4.4) |
| depression | | 28 (13.3) | 13 (8.6) | 7 (6.1) |
| | boys | 11 (11.5) | 7 (9.9) | 1 (2.1) |
| | girls | 17 (14.9) | 6 (7.5) | 6 (8.8) |

## Factors associated with PTSD and depression at 2 months, 9 months and 3 years

The factors suggested by univariate analysis that associated with PTSD and depression ($p<.05$) were entered into a binary logistic analysis model. In the first survey, the children who have seen anyone dead or injured and old age had a significantly higher prevalence of PTSD than children who didn't have such experience and younger age 12.6 and 3.9 times respectively. Children who have been with parents during tsunami got PTSD less than children who separated from parents 0.4 time. The affected children who had family member or closed friend injured and old age had higher prevalence rate of depression than children whose family member or friend didn't get injured and younger age 2.3 and 3.4 times respectively. (Table 3)

**Table 3** Multivariate analysis of PTSD and depression among affected children, the first survey (n=210)

| factors | | Total | depression | | | PTSD | | |
|---|---|---|---|---|---|---|---|---|
| | | | n% | OR (95%CI) | p-value | n% | OR (95%CI) | p-value |
| demographic | | | | | | | | |
| Age group, y | | | | | | | | |
| | 11-14 | 93 | 20 (21.5) | 3.38 (1.40-8.18) | <.01 | 20 (21.5) | 3.92 (1.76-10.52) | <.01 |
| | 7-10 | 117 | 8 (6.8) | 1 | | 6 (5.1) | 1 | |
| tsunami related traumatic experience | | | | | | | | |
| Saw anyone dead or injured | | | | | | | | |
| | Yes | 113 | 21 (18.6) | 2.20 (0.86-5.64) | 0.10 | 21 (18.6) | 12.61 (1.56-102.12) | <.01 |
| | No | 97 | 7 (7.2) | 1 | | 5 (5.2) | 1 | |
| have been with parents during tsunami | | | | | | | | |
| | Yes | 122 | 13 (10.7) | 0.74 (0.32-1.71) | 0.48 | 10 (8.2) | 0.40 (0.17-0.97) | .04 |
| | No | 88 | 15 (17.0) | 1 | | 16 (18.2) | 1 | |
| family member or closed friend injured | | | | | | | | |
| | Yes | 122 | 21 (17.2) | 2.34 (1.01-5.40) | 0.05 | 9 (21.4) | 1.21 (0.47-3.15) | 0.69 |
| | No | 88 | 7 (8.0) | 1 | | 17 (10.1) | 1 | |

In the second assessment, the children who have seen dead body had higher prevalence rate of PTSD than children who haven't seen dead body 8.1 times and children who felt they received delayed evacuation got 4.6 times higher prevalence rate of depression than children who had no such perception. (Table 4)

**Table 4** Multivariate analysis of PTSD and depression among affected children, the second survey

| factors | total N=151 | depression n% | depression OR (95%CI) | p-value | PTSD n% | PTSD OR (95%CI) | p-value |
|---|---|---|---|---|---|---|---|
| tsunami related traumatic sxperience | | | | | | | |
| saw dead body | | | | | | | |
| Yes | 86 | 12 (14.0) | 6.20 (0.75-51.05) | .09 | 11 (13.8) | 8.09 (1.65-39.74) | .03 |
| No | 65 | 1 (2.5) | 1 | | 2 (2.8) | 1 | |
| felt delayed evacuation | | | | | | | |
| Yes | 43 | 8 (18.6) | 4.55 (1.50-13.77) | <.01 | 5 (11.6) | 0.64 (0.19-2.20) | 0.64 |
| No | 108 | 5 (4.6) | 1 | | 8 (7.4) | 1 | |

In the third assessment, factor associated with PTSD was having felt delayed evacuation (OR (95%CI) =8.97(1.01-79.59)) (p=.019) and factor associated with depression was having heard Screams (OR (95%CI) = 7.93(0.98-64.23)) (p=.044), in univariate analysis. No factors associated with both PTSD and depression in multivariate analysis.

Depressive symptoms among affected children in the third survey Most of depressive symptoms among children in the 3rd survey were feeling sad (100%), having trouble in sleeping (57.4%), having somatic pain (33.9%), feeling bored (30.3%), having bad dream (28.7%) (Table 5).

**Table 5** Depressive symptoms among tsunami affected children in the 3rd survey, n=115

| symptoms of depression | number (%) | | |
|---|---|---|---|
| | almost | sometimes | never |
| I feel so sad I can hardly stand it. | 91 (79.1) | 24 (20.9) | 0 (0.0) |
| I sleep very well | 17 (14.8) | 32 (27.8) | 66 (57.4) |
| I get pain in my belly. | 3 (2.6) | 36 (31.3) | 76 (66.1) |
| I feel very bored. | 9 (7.8) | 27 (23.5) | 79 (68.7) |
| I have bad dreams. | 4 (3.5) | 29 (25.2) | 82 (71.3) |
| I feel like crying | 3 (2.6) | 25 (21.7) | 87 (75.7) |
| I feel very lonely | 5 (4.3) | 18 (15.7) | 92 (80.0) |
| I feel like running away | 6 (5.2) | 7 (6.1) | 102 (88.7) |
| I have lots of energy | 43 (37.4) | 32 (27.8) | 40 (34.8) |
| I think life isn't worth living | 2 (1.7) | 9 (7.8) | 104 (90.5) |
| I can stick up for myself | 93 (80.9) | 19 (16.5) | 3 (2.6) |
| I enjoy my food | 91 (79.2) | 19 (16.5) | 5 (4.3) |
| I enjoy the things I do as much as I used to | 86 (74.8) | 27 (23.5) | 2 (1.7) |
| I like talking with my family | 86 (74.8) | 26 (22.6) | 3 (2.6) |
| I like to go out to play | 73 (63.5) | 30 (26.1) | 12 (10.4) |
| I am easily cheered up | 64 (55.7) | 45 (39.1) | 6 (5.2) |
| I look forward to things as much as I used to | 61 (53.0) | 44 (38.3) | 10 (8.7) |
| I am good at the things I do | 36 (31.3) | 58 (50.4) | 21 (18.3) |

Symptoms of PTSD among affected children in the third survey. The common PTSD symptoms among children in the 3rd survey were feeling upset about their bad experiences (60.0%); feeling like bad things might happen again (40.0%); having somatic symptoms (39.2%); getting scared, afraid of, or upset when they think about bad experiences (38.3%);.feeling bad because they didn't do something as they should (32.1%) (Table 6).

**Table 6** PTSD symptoms among tsunami affected children in the 3rd survey, n=115

| symptoms of PTSD | number (%) | | |
|---|---|---|---|
| | sometimes, mostly | little of the time | never |
| feeling upset about their bad experiences. | 69 (60.0) | 23 (20.0) | 23 (20.0) |
| feeling like bad things might happen again. | 46 (40.0) | 29 (25.2) | 40 (34.8) |
| having stomachaches, headaches, or other sick feelings. | 45 (39.2) | 14 (12.2) | 56 (48.6) |
| getting scared, afraid of, or upset when they think about bad things experience. | 44 (38.3) | 29 (25.2) | 42 (36.5) |
| feeling bad because they didn't do something they wish they had done. | 37 (32.1) | 11 (9.6) | 67 (58.3) |
| staying away from things that make them remember bad things that have happened. | 36 (31.3) | 8 (7.0) | 71 (61.7) |
| feeling jumpy or nervous or easily startle. | 34 (29.6) | 12 (10.4) | 69 (60.0) |
| having nightmares about things that have happened. | 32 (27.8) | 15 (13.1) | 68 (59.1) |
| seeing pictures or hearing sounds in their mind about bad thing. | 31 (26.9) | 18 (15.7) | 66 (57.4) |
| recurrent thoughts about bad thing even when they don't want. | 31 (26.9) | 20 (17.4) | 64 (55.7) |
| feeling nervous when something reminds them of bad experience. | 29 (25.2) | 17 (14.8) | 69 (60.0) |
| starting to take more risks or misbehave. | 28 (24.3) | 9 (7.8) | 78 (67.8) |
| feeling scared, upset, or sad that they cannot talk or cry. | 25 (21.7) | 10 (8.7) | 80 (69.6) |
| feeling scared, upset, or sad that they don't really want to know how their feel. | 20 (17.4) | 19 (16.5) | 76 (66.1) |
| thoughts or feelings about bad things that happened to them get in the way? | 20 (17.4) | 13 (11.3) | 82 (71.3) |
| feeling alone inside or alone with your feelings. | 19 (16.4) | 10 (8.7) | 86 (74.9) |
| developing bad habits such as sucking your thumb or fingers, biting etc. | 15 (13.1) | 6 (5.2) | 94 (81.7) |
| having much fun when they play with their friends as they used to. | 107 (93.0) | 4 (3.5) | 4 (3.5) |
| sleeping well. | 101 (88.7) | 2 (1.7) | 12 (9.6) |
| paying attention or concentrate as easily as they used to. | 97 (84.3) | 6 (5.2) | 12 (10.5) |

## Discussion

The prevalence of PTSD and depression in the present study showed mixed findings in both sex. Many studies commonly found girls having more symptoms than boys[22,23]. While some studies contradicted the findings[10]. The present study showed that older age had higher rates of PTSD and depression in the first assessment.

In the present study, the prevalence of PTSD among affected children decreased by 14.5%, from 12.4% (26/210) to 10.6% (16/151), in the second assessment and up to 58.1%, to 5.2% (6/115), in the third assessment. The prevalence of depression among affected children decreased by 35.3%, from 13.3% (28/210) to 8.6% (13/151), in the second assessment and up to 54.1% decrease, to 6.1% (7/115), in the third assessment. These finding were similar to Yule studies that prevalence of PTSD declined to 20-30% by 5 years, and to Piyasil studies that the prevalence of PTSD decreased from 57.3% at 6 weeks to 4.5% at 3 years after natural disaster[16]. It meant that more than half of the children with mental health problems recovered at three years post-disaster. In addition, there was increasing in proportion of suicidal ideation among children with depression and PTSD over time.

Our data from these surveys showed that older children and children who had traumatic experiences were more susceptible to PTSD and depression than those who were younger and those who didn't have such experiences. Not only the traumatic experiences but also child's perception was a powerful predictor of mental health problems. Children who felt that they received delayed evacuation had higher (rate of) depression 4.5 times more than children who had no such perception. Mental health team should concerned both children who indeed had traumatic experiences and children who perceived threat or delayed evacuation during or after the disaster. Meanwhile, children who have been with parents during tsunami had less prevalence of PTSD than those who got separated from parents. It meant that being with parents while they were facing with disaster was protective factor. Having seen dead body was associated with PTSD in both assessments at 2 months and 9 months post-tsunami. But the severity of mental problems (posttraumatic stress disorder and depression) and features of objective tsunami- related experiences were not as replicated in a "dose-of-exposure" pattern that was congruent with the rates of death and destruction across areas as mentioned elsewhere[18].

In 3rd survey, most of the remaining PTSD symptoms were feeling upset about their experience. Nearly half of them had feeling like bad things might happen again and had somatic symptoms. One fourth of them had recurrent thought and images of traumatic events. Two most common symptoms of hyper-arousal were

feeling jumpy or nervous or easily startle (29.5%) and having nightmares about things that have happened (27.8%).

The present study showed that all children felt sad, half of them had trouble in sleeping. One third of them had somatic pain, felt bored, and had bad dream. The risk of suicidal ideation increased in individuals with prolonged depression and PTSD. Our finding, consistent with finding of Marshall[24], individuals with depression and PTSD had greater risk of suicidal ideation. The present study reflected that the affected children needed long-term rehabilitation especially children with mental problems and suicidal ideation.

Limitation: First, the instruments were not clinically validated in the Thai culture. Second, the limited sample size required us to recruit a supplemental sample of children present in the village schools at the time of our assessment in the first assessment that mention elsewhere[18]. In the follow up study, ¾ of the affected children were enrolled in the second and the third assessment. At that time, some families may moved into other regions to live with their families of origin or to work. Some children were kept in custody by relatives or friends of families for child safety and better living conditions.

Clinical implication: Our findings may provide a better understanding of post-tsunami mental health problems and associated risk factors. There were children not only directly had traumatic experiences, but also perceived threat or delayed evacuation during/ after disaster need psychological supports. New case finding and early intervention were important, and an long-term care in rehabilitation phase was essential. School–based program may be appropriate for mental health interventions.

## Conclusion

PTSD and depression among Thai children affected by the tsunami was high among children in severe affected area. The prevalence of PTSD and depression decreased over time. Traumatic experiences and perception of threat or delayed evacuation during/ after the tsunami and older age were associated with PTSD and depression. These results give guidance to inform the development of preventive interventions to improve the mental health of tsunami affected children and others affected by major natural disaster.

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