Health Issues after Fukushima Daiichi nuclear accident and its management

Department of Radiation Health Management
Fukushima Medical University School of Medicine
Masaharu TSUBOKURA
Multi-faceted disaster of Earthquake, Tsunami and…
2011.3.11
15:37
Haramachi region, Minamisoma
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2011.3.11
Haramachi region, Minamisoma
Death toll: 638 (approx. 1% of the population)
Minamisoma Evacuation camp
Immediate Mandatory Evacuation Orders

- 3/11 2:46pm  Earthquake occurred
- 3/11 3:37pm  Tsunami arrived
- 3/11 7:03pm  Nuclear emergency was declared
- 3/11 9:23pm  Evacuation order (3km radius)
- 3/12 5:44am  Evacuation order (10km radius)
- 3/12 3:36pm  Explosion at the unit 1 reactor
- 3/12 6:25pm  Evacuation order (20 km radius)
- 3/14 11:01am Explosion at the unit 3 reactor
- 3/15 11:00am Indoor restriction order (20-30km radius)

Hydrogen explosion at the unit 1 reactor

Hydrogen explosion at the unit 3 reactor
Minamisoma Municipal General Hospital
15 March – 18 March 2011: Mandatory evacuation using a coach
Patient Transportation by the Self Defense Force

92 patients were transferred to Nigata prefecture (150 km away)

20 March 2011 9:00  There were no patients left at the hospital
The risk of death among residents of nursing homes increased after the evacuation.

- The relative risk of death for nursing home residents during the post-disaster period was 2.68 times higher than the pre-disaster period in Minamisoma City. *1
- In several facilities, approximately 25% of residents died within 90 days after evacuation. *2
- The risk of death may increase by staying in the area with limited medical resources. *3

Most common cause of death was pneumonia.
How to maintain patient access to care?
Is this caused by oral hygiene?

Indirect death is more severe than direct death in Fukushima

**Human damage**

- **Disaster related death (As of Mar 2019)**
- **Direct death (As of Sep 2019)**
- **Missing (As of Sep 2019)**

**Fukushima**

2,272

1,614

196

**Miyagi**

928

9,542

1,218

**Iwate**

467

4,675

1,113

(計11,688)

Outside Fukushima

(×10000)

164,000

42,000 people, as of Dec. 2019

Outside Fukushima

In Fukushima

A wide range of health risks necessary to give considerations among people in radioactively contaminated area

- Radiation exposure
- Risk of Evacuation
- Psychological and Mental health
- lifestyle diseases
- Family separation
- Changes in the local/home environment
- Aging-population/depopulation/social isolation
- Changes in clinical services, nursing care supply and the accessibility of the hospitals
- Changes in the healthcare supply and demand
- Health disturbance among new residents from outside (decontamination/restoration workers)
- Social concerns and media (prejudice based on radiation exposure)
Change in air dose rate

5 Nov. 2011

2 Oct. 2020

7 years

Air dose rate (µSv/h)

Nuclear Regulation Authority, [https://radioactivity.nsr.go.jp/ja/list/362/list-1.html](https://radioactivity.nsr.go.jp/ja/list/362/list-1.html)
Zoning: Change in evacuation order

22 Apr. 2011

Evacuation order zone
Emergency evacuation preparation zone
Planned evacuation zone

8 Aug. 2013

Difficult-to-return zone
Restricted residence zone
Evacuation order cancellation preparation zone

10 Apr. 2019

Specified Reconstruction and Revitalization Base

Fukushima Prefectural Govt., [https://www.pref.fukushima.lg.jp/site/portal/list271-840.html](https://www.pref.fukushima.lg.jp/site/portal/list271-840.html)
Four months after the accident, Minamisoma City began the first systemic WBC internal contamination screening in Fukushima prefecture.

Earlier chair-shaped WBCs did not provide adequate shielding for the surrounding radiation and could not provide accurate measurements. *1

Second unit of the WBC were brought in from off-site center; however, the instrument itself was contaminated, and it took five months to start the test.

These tests were too late for the evaluation of the radioactive iodine.

Six months after the accident, a highly shielded standing WBC was introduced, enabling accurate measurement of internal contamination. *1

At the beginning of the test, cesium was detected in some subjects, but was subsequently lost. *2

Two years after the accident, a system was introduced in which all children were screened for school screening. *3

Individual monitoring and dietary advice were helpful in understanding the situation of contamination, reducing anxiety, and reviewing lives, but many subjects dropped out.*4

Once started, it became difficult to stop or reduce the number of tests, which was considered scientifically unnecessary.*5

1. Tsubokura et al. JAMA, 308 (7), 669-70.  
Radiation and Health seminars at the early phase of the incident
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Fukushima Health Management Survey (FHMS)

- Basic Survey: estimating residents’ external doses for the four months after the accident.

- Thyroid Examination: targeting all residents who were around 18 years old or younger as of March 11, 2011.

- Comprehensive Health Checkup: targeting people who used to reside in Evacuation Areas, being conducted with the aim of achieving the prevention, early detection, and treatment of lifestyle-related diseases that may be caused by changes in their living circumstances.

- Mental Health and Lifestyle Survey: targeting people from Evacuation Areas. This is for offering support to the disaster victims to ease anxiety and emotional trauma.

- Pregnancy and Birth Survey: targeting pregnant women who have worries over various things including radiation fears in relation to childbirth and child rearing.
Psychological distress and deterioration of life-style diseases (FHMS)

Percentage of those who need help with depression or anxiety

- Although percentage was high at 14.6% in 2011, it has improved by 2014 and has been moving around 7% since then.

- Compared to the ratio (3%) for the general population who was not affected by the disaster, it still shows a high value.

Impaired glucose tolerance

- The ratio of HbA1c 6.0% or more significantly increased in 16-39 years old in 2017 compared to 2011, but there was no significant change compared to 2016.

- For those aged 40 and over, the percentage in 2017 increased significantly compared to 2011, and also increased significantly compared to 2016.
Psychological distress among returnees were lower than evacuees. But still higher compared to the national average.

Returnees as a whole are in a better mental state than evacuees. However, the mental state of the returnees is worse than the national average.*1

- Although returning and restoring the original life is effective in reducing the mental burden, the low mental load of the person who returned may be the cause, not the result of the return.

- Mental state suddenly deteriorates after the evacuation order was lifted in some cases.*2
- Lower subjective well-being among people who moved to the restoration public housing.*3
- A 2nd spike in the number of suicides has been observed in the former-evacuation zone.*4

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2. Hori, Tsubokura et al. submitting
Lectures, dialogues, and activities...
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1. Individual
2. Family
3. Infrastructure
4. Society
Changes in the family environment

- In Minamisoma city, the risk of delay in breast cancer diagnosis was significantly higher for those of who are living without their children. *1
- Without adequate family and social support, it is difficult to live and to receive adequate treatment in former evacuation zone for end-stage cancer patients*2, psychiatric patients*3 and handicapped*4.

Changes in the accessibility of hospitals

- The access to hemodialysis in rural areas is vulnerable to external factors in the long-term after a nuclear incident. *5
- In Futaba region, total patient transport time increased by 22 minutes due to a massive number of hospital closures after the incident.*6
- In Soma region, total patient transport time increased but returned to the normal level within 3 months after the incident. *7

 Increases in expenditure on healthcare per capita compared to before the Fukushima incident

The average public expenditure on nursing care per older person increased by 30%. ($2,210 vs $1,693)*1

Possible causes of increased costs
• Aging society and nuclear families due to evacuation of the young people → Decrease of “informal care”*3
• Deterioration of physical function and increase of diseases requiring care *4
• Inducing demand associated with free medical and nursing care costs *5

Health disturbance among new residents from outside

- Many decontamination workers are in poor health, possibly associated with lower social capital.*1
- Legionellosis*2 and bee stings*3 among decontamination workers handling soil in unpopulated places.
- Tetanus caused by injuries during reconstruction work.*4


Stigmatization, prejudice and media coverage

- School bullying of affected children and adolescents *5
- Dissemination of “fake” health information by stakeholders *6
- Monopoly of information within SNS media by a small number of influencers *7

Countermeasures for the isolation of the elderly after the Fukushima disaster in Soma City

- Japan’s public health interventions have historically been holistic, community-driven enterprises, involving multidisciplinary doctors, local governments, industry and funders, cohesively working to meet the needs as identified by local communities.

Community housing project called Idobata-Nagaya

- Communal living space where there is a shared laundry facility, a common room for meals, and residents can check on each other’s health and wellbeing.
- Consists of 5 buildings with 58 personal rooms.

Park named Honebuto (meaning ‘bone-strength’)

- Built in the center of public restoration housing for easy access.
- Consists of 3 pieces of exercise equipment for measuring body flexibility and 5 pieces of equipment for exercise.
- Specialised non-barrier disabled-access systems for elderly with a wheelchair or walking stick.
Risk perception among residents
Summary

- There is a range of health risks to give serious considerations after a nuclear power plant accident.
- The risk of death marked the highest during the first month after the disaster among residents of nursing homes.
- Medium- and long-term problems emerged from a large scale change in people's way of life such as social isolation, an aging population, loss of motivation in life and conflicts among different generations.
- Risk perception regarding radiation exposure is generalized and the individuals have a tendency to selectively obtain biased information.
- It is necessary to establish achievable tasks out of various problems and to keep finding challenges which cold be tackled with current manpower.
Thank you!