

CONSIDERATION OF INDICATORS TO TRACK PROGRESS TOWARDS THE ELIMINATION OF IODINE DEFICIENCY

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ABSTRACT

BEBERAPA PERTIMBANGAN BEBERAPA INDIKATOR UNTUK MENENTUKAN KEBERHASILAN PROGRAM ELIMINASI GAKY DI INDONESIA

Pemeriksaan TGR (Tyroid Goiter Rate) yang dahulu dianjurkan oleh WHO (1993) kini sudah tidak dianjurkan lagi. Tulisan ini membahas mengapa TGR tidak dianjurkan lagi dan Urine Iodine Excretion (UIE) terbukti merupakan indikator yang lebih akurat untuk menilai keberhasilan program yodisasi garam. Pemeriksaan TGR terutama melalui palpasi pada kelenjar tyroid di leher tidak akurat karena beberapa hal. Pertama, pemeriksaan melalui palpasi sangat bervariasi hasilnya karena sangat subjektif terutama pada petugas kesehatan yang kurang pengalaman dan latihan dalam melakukan palpasi. Kedua, karena terjadinya pembesaran kelenjar tyroid membutuhkan waktu yang cukup lama, dan kembalinya kelenjar tersebut ke bentuk normal juga membutuhkan waktu pula, karena itu Total Goitre Rate (TGR) tidak mencerminkan status yodium saat ini tapi lebih mencerminkan kekurangan yodium di masa lampau. Pada beberapa kasus, pembesaran kelenjar tyroid bahkan tidak dapat kembali ke bentuk normal. Penilaian yodium melalui urin atau UIE dapat dijelaskan secara ilmiah dengan melihat data yang disajikan pada makalah ini. Penilaian UIE berarti menilai yodium yang berasal dari makanan dan minuman yang dikeluarkan melalui urin. Dengan demikian penilaian UIE mencerminkan keadaan yodium saat ini. Untuk individu, jumlah yodium di urin ditentukan oleh banyak faktor, karena itu penilaian UIE lebih baik untuk populasi daripada individu. Pada populasi, UIE digunakan untuk memperkirakan konsumsi rata-rata yodium yang berasal dari makanan. Bila UIE dari populasi cukup baik, maka dapat diperkirakan status yodium populasi cukup terjaga, sehingga penurunan IQ dapat dicegah. Bila kita korelasikan antara hasil penilaian melalui %TGR dan median UIE, maka keduanya tidak memiliki korelasi, karena keduanya mencerminkan keadaan yodium yang berbeda dari segi waktu. Demikian juga korelasi antara %TGR dan % cakupan garam beryodium ditingkat provinsi. Namun bila kita korelasikan antara %cakupan garam beryodium dengan median UIE maka keduanya memiliki korelasi yang cukup baik ($r^2=0.4727$). Pemberian kapsul yodium ternyata tidak mempunyai korelasi baik dengan UIE maupun dengan persentase cakupan garam beryodium. Hal ini disebabkan karena sifat kapsul yodium akan dibuang melalui urin pada minggu pertama setelah pemberian kapsul yodium kemudian sedikit demi sedikit menurun pada kurun waktu 6-9 bulan setelah pemberian. Sedangkan pengambilan data UIE adalah beberapa bulan setelah pemberian kapsul yodium. Perbedaan waktu tersebut menyebabkan tidak terdapatnya hubungan antara kedua variabel tersebut. Tulisan ini menguatkan bahwa untuk menilai cakupan garam beryodium dapat dicerminkan dengan penilaian menggunakan metoda yang tepat yaitu Urine Iodine Excretion (UIE) dan tidak lagi menggunakan TGR. (Jonathan, 2005)

Keywords:

INTRODUCTION

Iodine deficiency is the single most preventable cause of brain damage in the world and has long been recognized as a significant public health problem in Indonesia.¹ To address the problem of iodine deficiency, Indonesia has implemented a universal salt iodization program as this is the most cost-effective and sustainable intervention to ensure adequate intake of iodine in the diet. Scientific data are needed to verify that program activities are proceeding well and are having their desired impact. In the past, Goitre, or an enlarged thyroid gland, was the most common clinical condition related to iodine deficiency. However, iodine deficiency causes a wide spectrum of disabilities that includes psychomotor defects, impaired mental function and slowed cognitive development, hence the term iodine deficiency disorders (IDD).² Goiter only occurs when iodine deficiency has advanced to an advanced and severe degree. In fact, developing fetuses, infants, children and women of reproductive age are at high risk of iodine deficiency and the consequences of IDD for these groups are particularly significant since thyroid hormones are essential for mental and physical development, *in utero* or in postnatal life. Furthermore, brain damage in fetuses and infancy attributable to severe and prolonged iodine deficiency is likely to be irreversible.

WHO recommended goiter for assessing the status of IDD in population groups in 1993 and this has been adopted by many countries.³ However, it has become clear that goiter may not be the most appropriate indicator to measure changes in iodine status in the population resulting from increasing coverage and use of iodized salt. There are two important problems with the adoption of goiter as an indicator of IDD. First, there can be large inter-observer variability in the measurement of goiter, usually done by palpation. This variability increases as the goiters become smaller and

the subjectivity in the assessment leads to misclassification, particularly among health workers with little training and standardization. The second issue has to do with the fact that the development of goiter in an individual usually takes years; and once an individual's iodine nutrition is corrected, it may take years for their thyroid to return to "normal" size. For some individuals the thyroid may never return to "normal." This characteristic of goiter as an indicator of IDD makes it less appropriate where salt iodization programs are being implemented, and as such does not reflect *current* iodine nutrition status.

MATERIALS AND METHODS

More recently, the collection of casual urine specimens has been undertaken in order to measure iodine excretion, and this has been used to track progress in IDD control programs. Since most of the iodine consumed in the diet is excreted in the urine, the measurement of urinary iodine is a more accurate indicator of the current iodine status. In an individual, the amount of iodine in the urine can be quite variable depending on a number of factors; therefore a single urinary iodine level is not very informative. However, at the population level, the median level of iodine in urine specimens provides a good estimate of the average amount of iodine in the diet of the population.

If the iodine concentration of the population is adequate, then it is possible to be confident that the brains of newborns are being protected and the population will not suffer IQ loss due to iodine deficiency. Therefore at the population level, there is a direct correspondence between urinary iodine concentration levels and brain development.

Given the important biological differences between urinary iodine and goiter, it is not surprising that there is a lack of correlation between these two indicators. This has led to some confusion when interpreting results of IDD surveys in which both UIE and TGR are collected and

reported. For example, there are cases where the median urinary iodine concentration indicates adequate iodine nutrition, but the prevalence of goiter may be above 5% and indicates either mild or moderate levels of iodine deficiency. This is the situation currently being faced in Indonesia, where data from a national IDD prevalence survey conducted in 2003 lead to different interpretation of program status, as reflected in the following table.

RESULT AND DISCUSSION

Table 1 presents the three key indicators and goals recommended for tracking progress in IDD control, along with the current status of these parameters for Indonesia from the 2003 survey at the national level.

Table 1
Current Status of IDD in Indonesia

Indicator	Goal	Indonesia
Total Goiter Rate	< 5%	11.1%
Urinary Iodine (median)	100-300 µg/L	229 µg/L
Iodized salt coverage	> 90%	61.3%

As can be seen, there is a discrepancy in the indicators. While the TGR would lead to the conclusion that there is still a significant public health problem, the data on urinary iodine portrays a situation where iodine status is sufficient and IDD is being controlled. Indeed, the coverage of the population with adequately iodized salt has increased to 61.3%, while the proportion of all salt observed at the household level that had been iodized is over 80%. These figures show that there has been tremendous progress in efforts in ensuring that salt is being iodized and is penetrating into many parts of the country.

It is important to consider which indicator of iodine status most accurately reflects the impact of the salt iodization program, and this can be done by analyzing the correspondence between the indicators as presented in the following three figures.

These figures plot data from 28 Provinces for the coverage of adequately iodized salt, the prevalence of goiter and the median urinary iodine level.

The first figure plots the prevalence of goiter against urinary iodine at the Provincial level. If there was a perfect linear correspondence, the same UIE values would be observed in Provinces with a given TGR. However, less than ten percent of the variation in UIE ($R^2 = 0.09$) is explained by goiter, which suggests a very poor agreement. This is perhaps most pronounced for those Provinces with a TGR of 10%, where the median UIE varies from 110 µg/L to 320 µg/L. It is noteworthy to point out that the lowest median UIE observed was 110 µg/L, which is above the cut-off point established by the WHO to indicate adequate iodine nutrition.

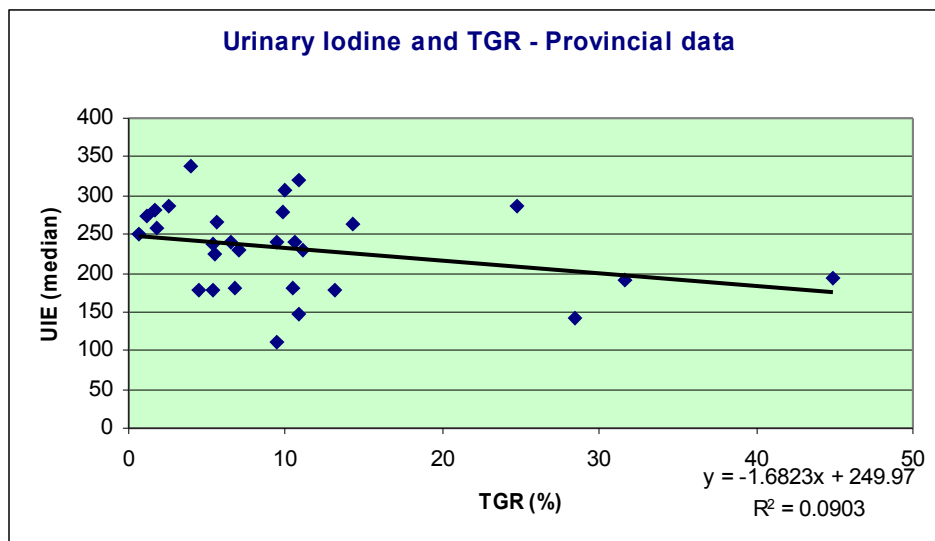


Figure 1
Correspondence between Urinary Iodine and Total Goiter at Provincial level

In the next figure, the prevalence of goiter is plotted against the coverage of adequately iodized salt, and once again there is a poor association and significant

variation. Using provinces with a TGR of 10% as a benchmark, the coverage of iodized salt at the Provincial level ranges from 22% to almost 90%.

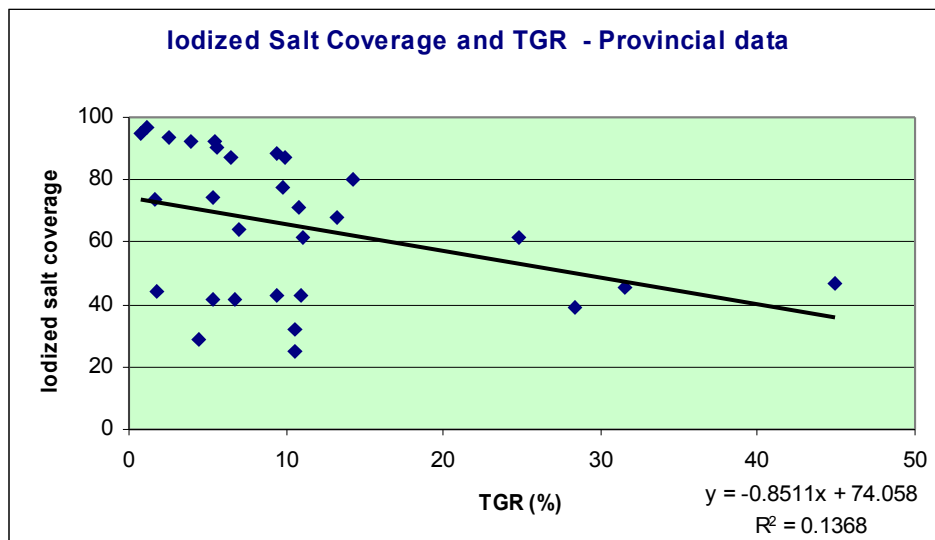


Figure 2
Correspondence between Iodized Salt coverage and Total Goiter at Provincial level

Finally, in Figure 3, the correspondence between the median UIE at the Provincial level and iodized salt coverage is presented. There is a much better association between these two indicators and demonstrates that

as the coverage of the population using adequately iodized salt increase, it is reflected by increases in the median urinary iodine level.

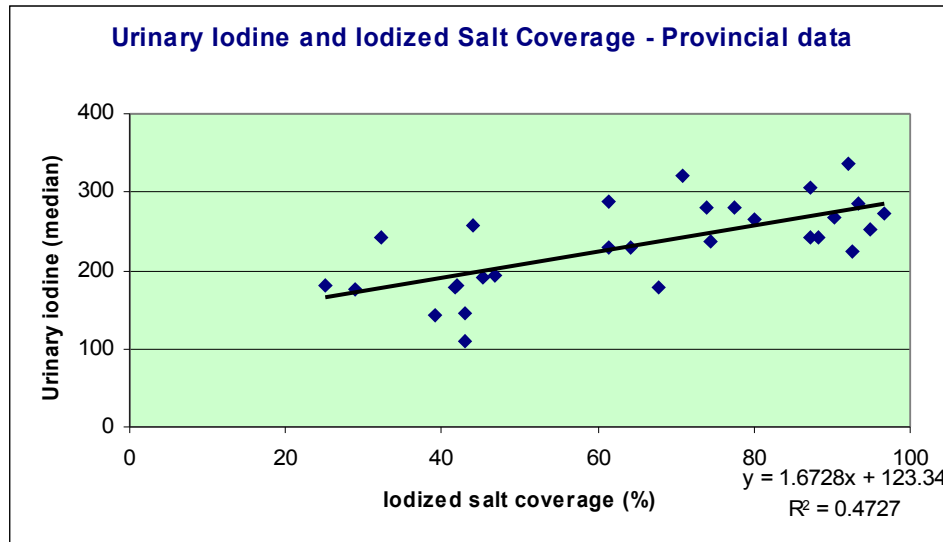


Figure 3
Correspondence between Urinary Iodine and Iodized Salt Coverage at Provincial level

From the 2003 national survey data, it is evident that reliance should be on urinary iodine concentrations to determine current iodine nutrition as a measure of the impact of salt iodization on the population, not thyroid size measures. Furthermore, when developing strategies for IDD control in Indonesia and targeting to areas at greatest risk of having inadequate iodine, e.g. IDD endemic, it is critical to use UIE rather than goiter, since this corresponds most closely to the current intake of iodine in the diet, and as such reflects efforts to ensure that the minimum physiological requirement for iodine is satisfied. Over the past two decades,

Indonesia has targeted iodized oil supplements to 'endemic' areas considered to be at highest risk of IDD. In the 2003 survey, data were also collected on the coverage of school children and women of reproductive age with iodized oil capsules in endemic areas.

In the following figure, the coverage of iodized salt is plotted against the median urinary iodine in thirteen 'block' districts, classified as moderately or severely endemic in 1998 where intensive program implementation took place, including the provision of iodized oil capsules.

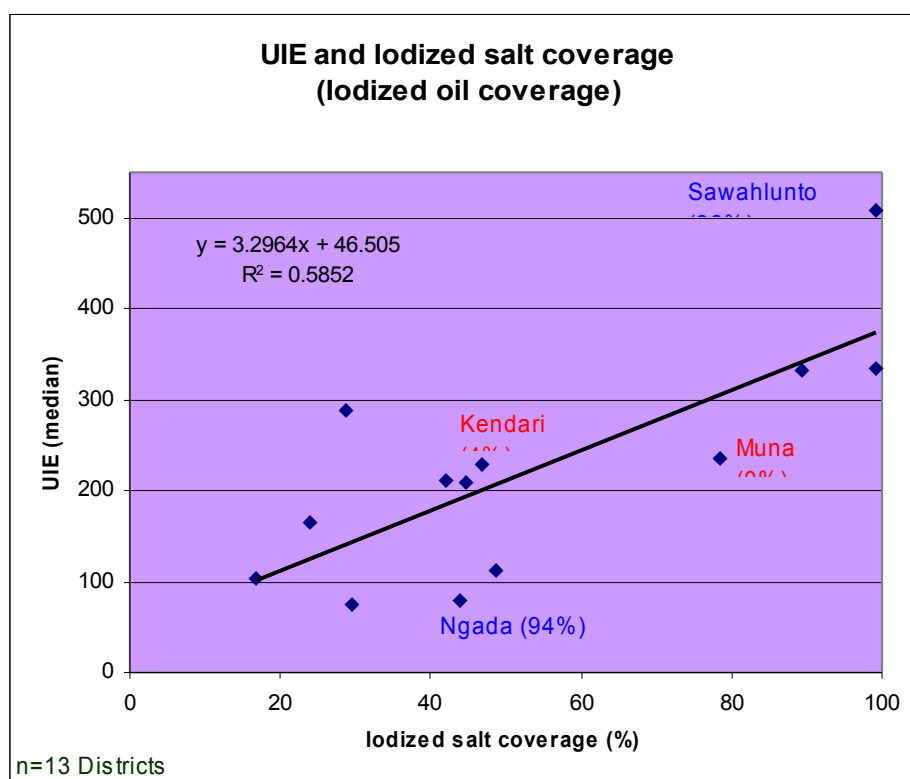


Figure 4
Correspondence between Urinary Iodine and Iodized Salt Coverage in 'Block' Districts –
controlling for iodized oil capsule coverage

As was the case with the Provincial data (Figure 3), there was a strong linear association between iodized salt coverage and median UIE levels. Here, almost 60% of the variation in UIE could be explained exclusively by the coverage of adequately iodized salt.

The graph also provides some additional information on the coverage of iodized oil capsules for four districts. In the case of Ngada and Sawahlunto, over 94% of children received iodized oil, while two other districts; Muna and Kendari, reported less than 5% coverage of capsules.

CONCLUSION AND SUGGESTION

As can be seen, the coverage of iodized oil capsules had no impact on the association between iodized salt and urinary iodine. There are a few reasons for this. First, the capsules may have been provided several months before the measurement of urinary iodine was assessed. It is well established that impact of iodized oil capsules on urinary iodine is most pronounced in the first weeks following supplementation and revert to baseline levels within six to nine months.⁴ Second, the amount of iodine being provided by iodized salt may be sufficient to satisfy physiological needs, so the additional iodine in the supplement was excreted. Third, there may be some problems with the estimates of iodized oil coverage.

These data were further analyzed by linear regression to determine whether the coverage of iodized oil could explain any of the variation in urinary iodine that was not already captured by iodized salt. In the model developed, iodized oil capsules did not provide any additional explanation, which is to say that the main determinant of urinary iodine, or of iodine intake, was the coverage of adequately iodized salt. The implication of this is that efforts should be taken to ensure that all edible salt in Indonesia is iodized and that it is possible to prevent iodine deficiency through salt iodization.

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