Networking and screening quality indicators

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SUMMARY

The NTS started in 1993 (3 years Bulgarian-Swiss project) in a new centralized screening unit at the University Pediatric Hospital in Sofia (PKU logistic since 1978. TSH was determined by Delfia (cut off at initial screening 15 mU/l, quality control DGKL) in 991 448 NB (till 30.11.2008). Data were registered by special software. Following changes occurred: increase of coverage from 58 (1993) to 99.5% (2007, p<0.001); shift to earlier screening-sampling on day 1 and 2 increased from 10.6 (1999) to 24.2 (2005) and 19.9% (2008), but decreased after day 5 from 10.9 to 4.9% (1999 vs 2008); High proportion of late (after day 11) arrived FPC during the whole period: 47 (2000), 17 (2005), 20.6% (2008); Decrease of NB with TSH >15 mU/l (1st FPC) from1.8 to 0.09 (1993 vs 2008, p<0.001). Different forms of primary thyroid disturbancies were diagnosed in 420 NB (1:2360 screened NB). Treatment with L-T4 was instituted at median age from 18 to 24 (1993 vs1997) and 13 to14 (2001-2002 vs2004-2008) days. Therapeutic strategy changed completely. Follow up studies in screened patients with good compliance showed normal growth and development, according to the individual genetic potential. Systematic thyroid screening in mothers (participation 82.9%) of children with abnormal NTS started in 1998. The NTS was adapted to monitor the iodine supplementation since 1997: NB with TSH >5 mU/l (3-5 day) increased from 7.8 (1997) to 9.6% (2000) and declined below 3% in 2006. Stable improvement of all screening process indicators was achieved by integrating efforts of all participants. The transition of the NTS in a more efficient public health program is a constant challenge and of utmost importance for the future extension of all neonatal screening programmes

fig.1 Administrative and technical data

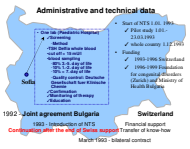
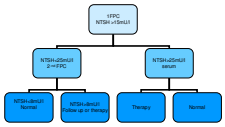


fig 3 Neonatal Thyroid Screening protocol Bulgaria 1993-2000



THE BULGARIAN NEONATAL THYROID SCREENING (NTS) PROGRAMME started in 1993 (3 years Bulgarian-Swiss project) in a new centralized screening unit at the University Pediatric Hospital in Sofia (fig1) using the existing PKU logistic (introduction of PKU screening in 1978 by L. Kalajidhieva, I. Kremensky et al.).

Aim of the NTS: prevention of irreversible mental retardation due to primary congenital hypothyroidism by implementation of the entire Programme (fig2); Main characteristic feature: introduction as 5 stage programme

GOALS

- ***Early diagnosis***
- ***Early and sufficient treatment (substitution with Thyroxine)***
- ***Effective monitoring of therapy***
- ***Precise final diagnosis***
- ***Avoiding of unnecessary hospitalizations***

SCREENING POPULATION AND METHODS

Blood was taken from newborns (NB) mainly on days 3-5 (2008:133 maternities, S&S 2992, 903).

Screening Method: TSH (Delfia®), range 0.6-249 mU/l, cut off for CH suspicion at initial screening 15 mU/, external quality control: DGKL;

Procedure according to the Screening protocol 1993-2000 (fig 3) and its refinement 2000-2008 (fig 4) ;Registration of data: centralized; Database for all screened NB and separately for all children with abnormal TSH screening results

RESULTS:

TSH was determined in 991 448 NB (till 30.11.2008). Following changes occurred: increase of coverage from 58 (1993) to 99.8% (2008, p<0.001, fig 5-7); shift to earlier screening-sampling on day 1 and 2 increased from 10.6 (1999) to 24.2 (2005) and 19.9% (2008), but decreased after day 5 from 10.9 to 4.9% (1999 vs 2008, fig 8a); High proportion of late (after day 11) arrived FPC during the whole period: 47 (2000), 17 (2005), 20.6% (2008, fig 8b); Decrease of NB with TSH >15 mU/l (1st FPC) from1.8 to 0.09 (1993 vs 2008, p<0.001, fig 5b). Different forms of primary thyroid disturbancies were diagnosed in 420 NB (1:2360 screened NB, fig 9,10). Treatment with L-T4 was instituted at median age from 18 to 24 (1993 vs1997) and 13 to14 (2001-2002 vs2004-2008, fig 11) days. Therapeutic strategy changed completely . Follow up studies in screened patients with good compliance showed normal growth and development, according to the individual genetic potential (fig 12-15). Systematic thyroid screening in mothers (participation 82.9%) of children with abnormal NTS started in 1998. The overall prevalence of the different thyroid disturbances is about 28% (fig 16) The NTS was adapted to monitor the iodine supplementation since 1997: NB with TSH >5 mU/l (3-5 day) increased from 7.8 (1997) to 9.6% (2000) and declined below 3% in 2006 (fig 17-19). In order to achieve the NTS Programme goals a new spezialized network was created and maintained on a voluntary basis by different specialists all over the country (fig 20).

fig.2 NTS programme – activities, time and participants

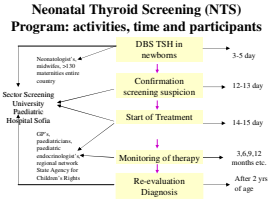


fig4 Neonatal Thyroid Screening Protocol Bulgaria 2000-2008

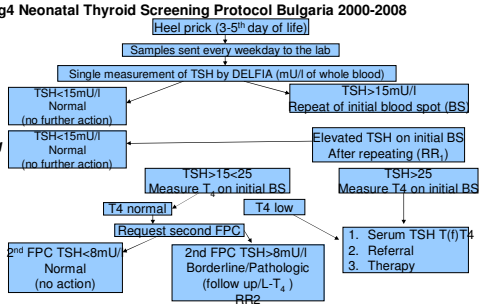


fig 5a, b: Newborn screening participation and NTSH cut off dynamic

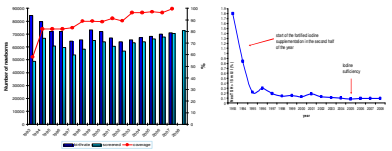


fig 7 Regional dynamic newborn screening participation 2006 in Bulgaria

fig 6 Regional dynamic newborn screening participation 1994 in Bulgaria

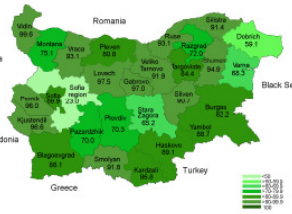


fig 9 Overall prevalence of thyroid disorders in Bulgaria detected by NTS

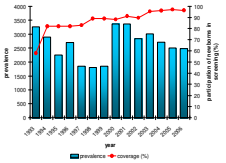


fig.11 Median age at start of therapy in children with congenital hypothyroidism

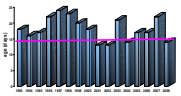


fig 8 a, b: Newborn age structure at blood sampling and lab registration

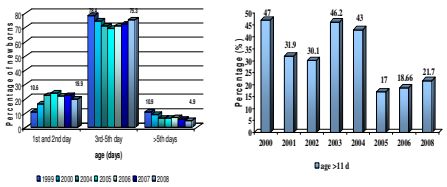


fig.13 Correlation between bone age and chronological age at study performance

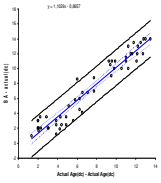


fig.15 Mean school marks for the previous year (n=31): mean 5.52±0.7 (literature – 5.55±0.8; mathematics – 5.29±0.9, n.s.)#

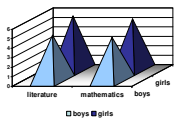


fig10 Regional and nation-wide prevalence of hypothyroid disorders in Bulgaria (1993-1999)

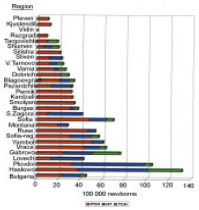


fig.12Pre- and postnatal length, height in children with permanent CH (orthotopic thyroid gland) picked up by NTS in Bulgaria 1993-2006 compared to MPH and TH based on Prader norms (mean ± SEM)

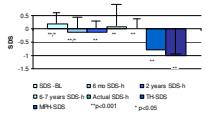


fig.17 Frequency of newborns with NTSH > 5mU/l and percentage of effectively iodized (KIO3 28-55 ppm) food grade salt in Bulgaria

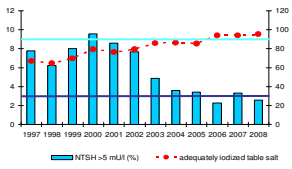


fig. 14 a,b: Dynamic of Serum TSH, T4 before and during therapy with L-Thyroxin in children with CH (Hypoplasia), picked up by NTS in Bulgaria

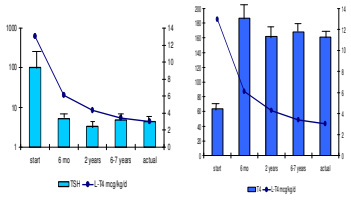


fig.18 Mapping of all Bulgarian districts according to the frequency of TSH above 5 mU/l for 1997

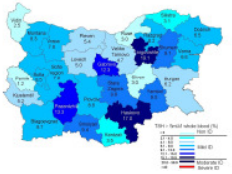


fig.20 NTS Network: Bulgaria 1998-2007

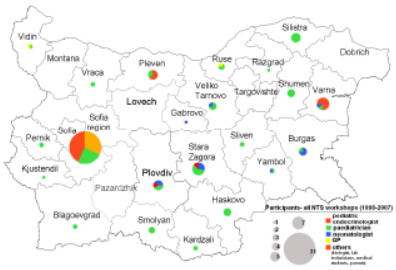


fig.19 Mapping of all Bulgarian districts according to the frequency of TSH above 5 mU/l for 2008

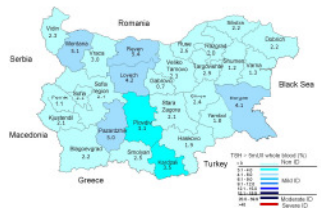


fig. 16 Frequency of thyroid disturbances in mothers of children with abnormal thyroid screening results